Gunsmithing

GUNS OF THE OLD WEST

DAVID R. CHICOINE

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Dedication and a note of thanks

This book is dedicated to that one person who showed me the value of steadfast perseverance, who shamed me into giving up my old typewriter so I would learn to use a computer, who believed in me when I believed no one else did, who shared and nurtured my beliefs in God, my love for our children, and without whom this manuscript would not have been written; my lifelong friend and wife Kathy.

A very special thank you also goes out to our three children who have always given such enthusiastic, unwavering support and who have never failed to remember to tell "daddy" how proud they were of him; my daughters Dallas Jan and Margaret Rose and to my son, David T. Chicoine who not only provided some of the wonderful S&W illustrations for this book, but unselfishly gave of his own time to help work on the backlog in my gun shop while it was being written.

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Foreword

People have always enjoyed looking back in time, down into what must seem to some a more adventurous times. More often than not I think we do this with a view toward imagining ourselves back there, being apart of a simpler time; far away from the fast-paced and complex work-a-day world in which we live. Well, here we are in 2001 with public interest in the history of the American West continuing to grow. One outgrowth of all this thirst for information about these colorful and fascinating times has been the amazingly rapid growth of a popular new shooting sport known as *Cowboy Action Shooting* or CAS.

Typically, the news media has not taken much notice of this sport and we shouldn't be too surprised; its a success story involving guns and shooting, and within this new sport a wonderful, healthy, family-oriented camaraderie has occurred. Maybe the media should take another look, society is actually working here, could something be amiss? One day a month, or more, these people are dressing up like cowboys, sheriffs and saloon girls. They are calling each other by incredibly corny aliases, wearing marshal's badges, and shooting real guns in competition against one another (*not at* one another) in staged events. All of this is being done in the spirit of good clean fun. People are getting along famously and guess what?. . .no body is getting hurt. It seems that plain everyday folks like you and me, (heck, some of 'em are even doctors, lawyers and such) are getting dressed up in home-spun clothing, donning dingy Stetson hats, feigning Wyoming accents and role-playing the parts of characters, both real and imagined, who lived or may have lived, in the Old West.

Through my career as a gunsmith specializing in antique firearms repair over the last 20-odd years, I have come to know quite a few people who participate in this new sport and every one of them I have met is just as sane as I am. In fact, the people who are active in this sport form a truly diverse slice of the proverbial American pie. Individuals from all walks of life regularly attend the CAS matches, some of whom travel great distances in order to participate as often as they possibly can. CAS is certainly one of the fastest, if not the fastest-growing shooting sport today and I believe a big part of its popularity is that fun-loving, role-playing camaraderie. Oh, and yes; the competition portions of these cowboy events do involve shooting real guns at steel targets with live ammunition. However, the organizers are taking themselves very seriously, so much so that their safety record speaks for itself. When you consider the large numbers of people that are involved, I don't believe there has ever been a safer shooting sport.

So, here we have this new shooting sport and all of a sudden it seems everyone wants Colt SAAs and big Smith & Wesson top-breaks and Winchester lever-action rifles to shoot. All of these are guns that were used during the winning of the West, only. . .there aren't nearly enough of the originals to go around. Spurred by this new demand, collector prices soon began to escalate. By the early 1990s weapons that I used to repair and restore primarily for arms collectors where suddenly in much greater demand, and more people than ever before were bringing and sending them to me to be put into good order so that they could once again be fired. That was about the time when some of the replica arms companies started to take notice, stepped up to the plate and began to provide the public with working copies (some insist on calling them clones, even though most aren't) of the popular original weapons from this era. At the start there were a bunch of replicas of percussion Colts and Remingtons, a Henry look-a-like, and a few Colt Single Action copies around. That was back in the early days when the sport was just getting popular. But the demand was quickly increasing and people wanted the guns to look more authentic. As the sport continued to grow, along with it grew more of a techno-historical interest in the West and the sorts of weaponry, clothing, and everyday utensils actually used there. This led to more shooters wanting to have more different kinds of 19th Century firearms that they could shoot, and that meant handguns other than Colts were needed. Now a shooter can buy variations of the early single action Colts, Remington, Smith & Wesson Schofield and Russian model revolvers, Henry and Winchester lever rifles and replicas of early shotguns.

While I have not seen any recent production figures, it wouldn't surprise me a bit to learn that in many cases the replica arms may already have surpassed the number of originals ever produced. For the most part these replicas are guns that we've never seen before because many of them differ internally (and some externally) from the originals they are meant to mimic. They are for the most part good copies of the original designs but a goodly number of them are not completely true and faithful copies. With some, their actions had to be altered for importation into the U.S. by the addition of hammer-block safety devices. In other cases, the replica manufacturer decided to alter the original design in the interest of economy of manufacture or because of some engineering challenge. In still other cases it appears that some replica makers deliberately set out to redesign a good thing, although efforts in that direction have not always met with perfectly successful results.

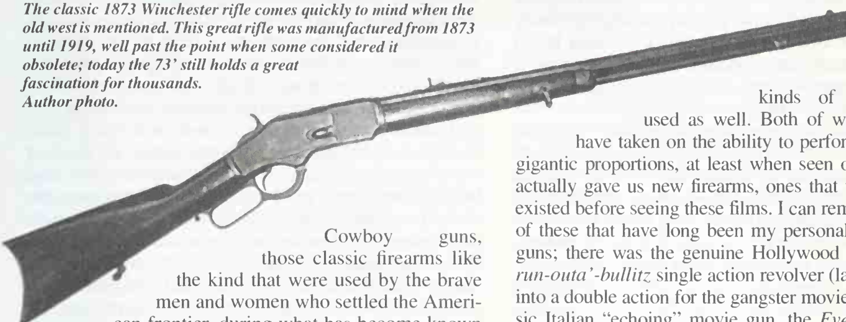
Thousands of new guns are being manufactured, imported and sold each year. These guns are all based on variations of 100-year-old designs and there is a distinct shortage of technicians who are familiar with them and are capable of servicing, and repairing them. That's where this book comes in, by presenting the reader with repair information and take-down instructions that will help to fill in some of the blank spaces about the original weapons. While we won't be digging very far into major repairs in a work of this scope, we will present a basic knowledge of how these guns function. The book is also a primer on how to take care of some of the more common repair jobs you are likely to run into. As well as some solid general repair information that is applicable to older firearms. I hope this will be a valuable source of new information for those gunsmiths and amateurs who will set out to repair the original weapons and the Old West and the replica guns of our *New West*.

David R. Chicoine
North Carolina
April 7, 2001

CONTENTS

CHAPTER 1

An introduction to the guns of the old and of the *new* West



The classic 1873 Winchester rifle comes quickly to mind when the old west is mentioned. This great rifle was manufactured from 1873 until 1919, well past the point when some considered it obsolete; today the 73' still holds a great fascination for thousands. Author photo.

Cowboy guns, those classic firearms like the kind that were used by the brave men and women who settled the American frontier, during what has become known as the *Old West* have been a popular topic for as long as I can remember. A source of continual fascination to young and old alike, these weapons have become icons through media exposure. They have been transformed into symbols of modern man's fanciful notions about a world which didn't quite exist; oh, it existed all right, just not quite the way it has been represented to us in the movies. I can remember it first happening during my youth, TV was still new then and the parents of maybe half of the kids in my fifth grade class had a set at home, it was considered quite the modern marvel. Make no mistake about it, we believed as did our parents, that everything we saw coming out of that picture tube was to be taken as gospel. All the kids my age saturated ourselves in the frequently aired cowboy-drama television shows and western movies that permeated the entertainment world of the 1950s and '60s, it's easy to recall that we loved every minute of it. On a regular basis several of us would go to one boy's house for supper on the evening that "Have Gun Will Travel" aired, for our little group Paladin was an absolute "must see," fortunately, this kid's dad thought so, too.

Watching all those cowboy "horse" operas did have an effect in shaping popular opinions, about not only the characters who were involved in the settling of the American frontiers, but about the kinds of weapons they used as well. Both of which seemed to have taken on the ability to perform feats of truly gigantic proportions, at least when seen on film. Cinema actually gave us new firearms, ones that we didn't know existed before seeing these films. I can remember a couple of these that have long been my personal favorite movie guns; there was the genuine Hollywood 'N Co. *Can-'t-run-outa'-bullitz* single action revolver (later they made it into a double action for the gangster movies), and the classic Italian "echoing" movie gun, the *Every-shot-a-ricochet rifle*.

During the years when I was growing up, I got to spend a good portion of my time among local gun collectors and shooters, this was in the 1950s and '60s and most of these guys were veterans of WWI and WWII, all of them were my seniors and some by many years. It is very easy for me to remember back to when a fine old Winchester 73' or Colt Peacemaker was highly valued as a treasured find, and this had almost nothing to do with its monetary value. It was the idea that you could almost feel the mystique of western lore exuding from one. Those two guns of course were among those few that were considered by most folks to be the standard equipment of the cowboy, the gunfighter and the western lawman; the notion was that anything other than a Colt, a Sharps or a Winchester was consider an "other gun," somehow it must be of less quality. You definitely wouldn't want to trust your life to one of those "other guns." The proof of all this of course, had already been provided to the public on TV or the silver screen after all; we saw it with our own eyes, how could we be wrong? The people who magically sent those pictures threw the airwaves to the TV set in my living room "must" know a lot more about it than we do.

As you can see, the general idea was that people believed those "other guns" were

The Powder & the Power

definitely not anything a real man would ever want to use, much less be seen using. The funny thing is that some of the west's genuine legends, real bad-boys whose "grit" would never be questioned like Frank James, Wild Bill Hickock and Wyatt Earp; these fellows strangely enough seemed to have a penchant for using, and in some cases preferring those "other guns." The truth about the old west is that there were lots of other kinds of firearms used during that colorful time of westward expansion that we seem fond of calling the "winning of the west." Those guns appeared just exactly like the people who used them, with different brand names, and in many shapes, colors, calibers (referring to both size and quality) and sizes and in both muzzle loading and metallic cartridge versions.

People still debate the exact era when the events that have come to be called the "winning of the west" occurred. Personally, I've always liked to think in terms of it (*it*, being the full-fledged westward expansion of American civilization and the settling of the west) having begun just after the Lewis and Clark expedition got home in 1806 and continuing on to about 1890. However, the more common and popular time frame places it from about the end of the Civil War in 1865 through roughly 1900, therefore we will focus on the guns used in this period.

There is no single gun that can ever hold the title of being "the" gun that won the West, In truth, there are many to choose from and in fact, they should all hold the title; from the large, heavy caliber handguns which, because of their size were normally carried in holsters or on a saddle, very often serving the equally serious dual purpose of putting meat in the pot and that of a weapon for personal defense, to the myriad of small and medium sized handguns of so many different brands and types that fired puny sized, usually low-powered cartridges and which were almost always small enough to be easily hid in the pocket. Little pistols like this were used primarily for self defense, and based on actual production figures from the major gun manufacturers, they were by far the most prominent sort of handgun in use during that era. Small and medium size handguns were also very popular with hunters and animal trappers who used them as an inexpensive means of giving the *coup de gras* to their trapped prey.

Then there were rifles, large and small. Some rifles were muzzle loaders and for sound economic reasons a good many of these were still in use well into the "metallic cartridge era." Other rifles used metallic cartridges, but were capable of firing only one shot and then they had to be manually re-loaded, while still others called repeaters, held many metallic cartridges in ready-reserve and could be fired over and over simply by operating a lever, a bolt or a slide. These rapid-fire repeating rifles, not unlike the early Colt revolvers, did much to revolutionize the state of personal weaponry when they were first introduced by dramatically increasing the amount of "firepower" one man could carry on his person.

This next point may be argued by some, but from what evidences I have both seen and read, by far the most common firearm of all on the American frontier was almost certainly the shotgun. This class of weapon was originally found only in single and side-by-side double barreled configurations, though eventually the shotgun was also built as a single barreled repeater in several forms. Just about every early American family who lived on or near the frontiers owned a shotgun and since most farm families were just eking by, with only enough money to buy one firearm for the household, the great majority of those shotguns were of the inexpensive variety, with many muzzle loading shotguns still being used by poorer individuals well into the late 19th century. During this period the shotgun was also in general use by law enforcement, as well as by bank, train, "express" and stage coach guards. Today we think of the shotgun as being most commonly used for bird hunting, with some pump and semi-auto shotguns specially prepared for police use, for self defense or for short-range deer hunting; such was not the case at the farms and ranches on the frontiers of early America. These frontier shotguns were constantly in hard use as the true multi-task weapons they were, to perform the very necessary function of putting meat on the table every single day; this of course included the taking of all sorts of game animals, large, small and fowl. Social self defense was surely a secondary use for the family shotgun, but one which when viewed muzzle-end on from close range would have presented a truly disconcerting picture to any potential two-legged enemy.

If there is one thing that most collectors and gun fanciers will nearly always agree on, it is that the classic 19th century firearms, even some of the less expensive ones, were by and large beautiful things to look at. Ascetically, their shapes and forms seem to have a universal appeal that easily spans generations. If you look just a little bit closer you will, for the most part, find the fit and finish of their metal and wood to be some of the best the world has ever known. So good was this fit and finish that was being mass-produced by the better known early gun factories that it will not be seen again in our age, excepting on a few of the more expensive custom-made firearms. You ask why? The answer to the question is too easy to be a pleasant one, but the fact is that this sort of work is labor intensive in the extreme to produce. That high standard of beauty and quality required far more parts to be made with a higher degree of precision machine work than most modern arms do, and much of the pretty finish work mandated the use of dangerous chemicals and special work environments. In short, this kind of intense machining and hand workmanship is just too doggoned expensive to reproduce in quantity today.

Who made the guns of the old west anyway? In contradiction to the entertainment world's usual presentation, these guns weren't made by just a two or three companies, but by a long list of American and foreign makers, with a few like Colt, Marlin, Winchester or

Smith & Wesson that will be familiar to most readers and who, in one form or another, are still in business today. Others such as Adams, Ethan Allen, Ballard, Jenks, Merwin-Hulbert, Starr or Sharps live on for the most part only in arms collections or in our memories.

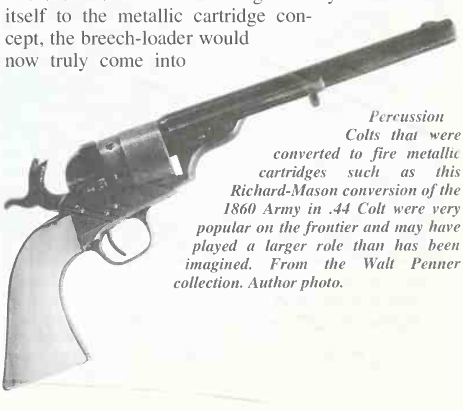
Here is a shocking fact: There were no shopping malls back then, a fact that when properly considered, might well keep most old west afficionados from actually *doing* the time-travel thing — if that were possible. In fact, our shopping habits were very different from what they have become today. Most people, especially those living in rural areas shopped from the catalogs they could read while visiting their local emporium, general, or hardware store. Those catalog purchases generated the still unnumbered categories of *other*, lower priced firearms which very often bore no makers name at all. Inexpensive firearms like these and of all types were manufactured in the many smaller gun factories that at one time permeated the northeastern United States and the lowlands of Europe. More than a few of those arms were later retailed under numerous creative trade-names by countless general, hardware and department stores, and sadly, many of their anonymous manufacturers are long since extinct.

Alright then, what exactly were these *guns of the old west?* What kinds of guns were the most popular and who made them? You might be surprised, but to paint that picture correctly we have leave Hollywood behind and go back to the time around the U.S. Civil War, both before and after, to take a short historical look at what was happening with firearms in America.

Cartridges made of brass like the ones we use today were a brand new, and as yet un-perfected idea, that in the early 1860's was still considered to be out somewhere on the left edge of radical. Until just prior to this awful war, almost all firearms were loaded by the centuries old method; at the rate of one shot at a time through their muzzles, either with loose powder and ball or with wrapped powder and ball, in the form of a paper "cartridge." The paper cartridge so-called, simply held the components together until they could be loaded; it was itself consumed during firing. There were some breech-loaded weapons in use during the muzzle loading era; a good example of this would be the Sharps which used an under-lever that caused its massive sliding breech block to drop down when the lever was operated, thus exposing the rear of the barrel for loading. Breech-loaders like this one enabled the ball and the powder to be placed directly into the chamber at the rear of the barrel, thus eliminating the slow, ponderous steps of pouring powder and ramming the ball down the long barrel from the muzzle and offering the advantage of easily loading a groove diameter bullet that filled the rifling completely. As advanced as these early breech loading firearms were for their day, their ignition systems still used a separate explosive primer-cap based on the prevalent percussion system which itself dated from the 1830's.

Weapons using the percussion system make use of a priming device called the percussion cap; this is a small cup-shaped, copper "cap" which contained a small explosive charge; the percussion cap was placed over that part of the gun known as a "nipple." The nipple was screwed into the rear of the barrel's chamber, the area containing the powder, (nipples are positioned at the rear of a gun or rifle barrel, or with the percussion revolver; the nipples are screwed into the rear of each chamber in the cylinder, in either case placing the primer's explosion behind the powder charge.) The nipple is hollow, having a small hole running lengthwise though its center which it was able to transmit the explosive energy or "fire" from the exploding percussion cap to the powder charge. When a percussion weapon was fired, the succession of events went like this: The firearm's trigger was pulled allowing the hammer to fall and strike the percussion cap. When struck, the fulminate (an explosive brew that was "painted" on the inside of the cap) in the percussion cap exploded, sending its fiery explosive energy through the hollow nipple and into the barrel's chamber where it ignited the main powder charge.

Development of the metallic cartridge in the late 1850's opened up entirely new concepts in firearms and when the U. S. Civil War ended in 1865 this new era had already begun to dawn brightly on the firearms world. These metallic cartridges were completely self contained, having everything they needed to fire already within themselves, including the primer-cap; all the shooter had to do was open the breech of the weapon and insert the cartridge into the barrel's chamber, close the breech, cock the arm and fire. In short, these were vastly quicker and easier to load and re-load than any of the previous variations of the muzzle loading system. On top of that, with this pre-loaded ammunition, you no longer had to worry about getting caught in the rain, until the advent of metallic cartridges this had always been a major source of concern with loose-powder weapons; now your powder would always be dry. By virtue of the fact that its design readily lent itself to the metallic cartridge concept, the breech-loader would now truly come into



Percussion Colts that were converted to fire metallic cartridges such as this Richard-Mason conversion of the 1860 Army in .44 Colt were very popular on the frontier and may have played a larger role than has been imagined. From the Walt Penner collection. Author photo.

Introduced in 1857, Smith & Wesson's little 7-shot Model Number One pistol in .22 S&W Rimfire was the first successful metallic cartridge revolver. From the John Watts Collection. Author photo.

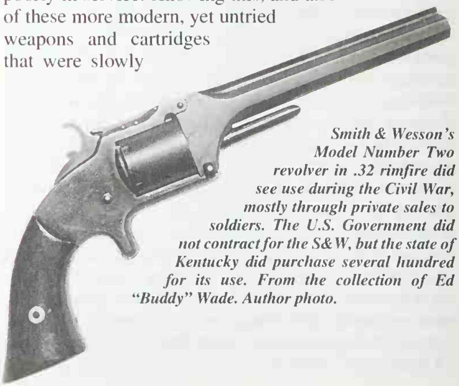
its own; in fact almost as soon as these metallic cartridges began to appear, people began to convert breech loading percussion weapons to fire them. By the late 1860's, some muzzle loading percussion weapons, including many percussion revolvers were being converted into breech loaders. In the case of cap-n-ball revolvers, by literally cutting off the closed breech portion at the rear of their cylinders, this exposed the rear of the chambers and allowed metallic cartridges to be inserted from the rear.

Metallic cartridges themselves were actually introduced in this country a few years prior to the Civil War, by Smith & Wesson in 1857 with their tiny brass .22 rimfire Model One cartridge and the seven shot, tip-up barrel Model Number One revolver that fired it. This was not a converted percussion revolver; it was the first revolver with cylinder chambers which were bored through from front to rear, allowing it to accept metallic cartridges. In fact, Smith & Wesson held an exclusive patent on this concept that lasted until 1869. In 1859, the Sharps Company introduced their famous four-barrel derringer with which Sharps got around the S&W/Rollin White cylinder patents by using a ratchet-operated revolving firing pin that individually addressed each of the guns' four barrels. Sharps made these pistols from 1859 until 1874 in calibers .22, .30 and .32 rimfire.

By 1860, B. Tyler Henry had his own enlarged version of the metallic cartridge ready for the public, the .44 Henry rimfire; along with it he had an astounding lever-operated, toggle-action, breech-loading repeating rifle to fire this new ammunition. The revolutionary Henry held one cartridge in the chamber, but after that had been fired, the shooter pulled down on a lever which opened the breech, extracted the fired cartridge casing, re-cocked the hammer and operated a magazine which automatically placed another cartridge in line with the chamber. The act of pulling up on the same lever pushed the new cartridge into the chamber and then closed and locked the breech. In effect, at the flick of the wrist, the Henry repeating rifle was instantly re-charged and ready to fire again. The Henry's magazine was mounted under its barrel and held, what at the time was, the astounding capacity of 14 cartridges.

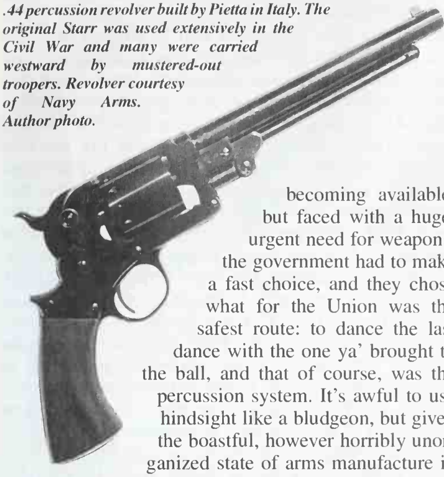
Aldo Uberti makes this lovely replica of the legendary Henry rifle in 44/40 caliber. The rifle is a very faithful copy except for an improved firing pin; it's brass framed as the original, and this one is decked out with a nitre blued barrel and lever. Rifle courtesy of Uberti USA. Author photo.

As a Civil War loomed ominously closer, other metallic cartridge firearms began to appear, weapons such as the Spencer repeater which used a butt-fed magazine. By 1861, war was suddenly upon us, and due to the severe supply and time constraints that were imposed on the U. S. Army by the urgency of the day, that war ended up being fought largely with weapons that relied on the percussion ignition system. This was in spite of those new metallic cartridge and repeating firearm developments. We have often heard people criticize the Army for not having adopted both cartridge weapons and cartridge repeaters on a large scale; these people feel the war would have ended sooner. What they aren't or won't take into account, is that America's arms industry was heavily geared toward the manufacture of arms and ammunition of the percussion system at the start of the war. The cold, hard facts tell us that many of the arms factories were not even able to deliver the number of percussion ignition weapons they had promised in the time frames they were promised. More than this, a few weapons, like the Colt revolving rifle, had design defects and were already performing poorly in service. Knowing this, and also of these more modern, yet untried weapons and cartridges that were slowly



Smith & Wesson's Model Number Two revolver in .32 rimfire did see use during the Civil War, mostly through private sales to soldiers. The U.S. Government did not contract for the S&W, but the state of Kentucky did purchase several hundred for its use. From the collection of Ed "Buddy" Wade. Author photo.

This is Navy Arms new replica of Starr's single action .44 percussion revolver built by Pietta in Italy. The original Starr was used extensively in the Civil War and many were carried westward by mustered-out troopers. Revolver courtesy of Navy Arms. Author photo.



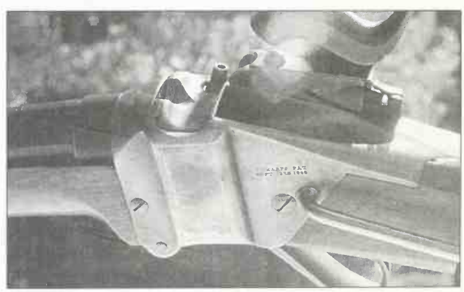
becoming available, but faced with a huge, urgent need for weapons, the government had to make a fast choice, and they chose what for the Union was the safest route: to dance the last dance with the one ya' brought to the ball, and that of course, was the percussion system. It's awful to use hindsight like a bludgeon, but given the boastful, however horribly unorganized state of arms manufacture in this country in 1861, I really don't think the Army had a choice.

Limited numbers of metallic cartridge weapons, some with repeating capability such as the Henry and the Spencer, were indeed purchased by the Army and used during the war, though never in large quantities. None of the new S&W cartridge revolvers were ever purchased by the U.S. Army during the war, although the state of Kentucky did purchase several hundred of the larger, S&W Model Number Two revolvers. In general, these radical new weapons were used with success despite some drawbacks that were experienced in the field during the teething stages of the coupling of these brand new ideas.

As the war ended in 1865, thousands of veterans went home, bringing with them an equal number of the percussion weapons which had served them so faithfully during those years of conflict. The westward expansion and migration that had been so recently interrupted, now began once again and this time in earnest, as many of those recent veterans began to look to the direction of the setting sun, to the unexplored, unknown vastness of the American west as their promise for a new life. These first "cowboy guns" or "guns of the frontier" that went west, were for the most part percussion weapons; guns such as single shot Springfield rifles and Sharps carbines, Colt, Remington and Starr percussion revolvers and many, many other brand names of rifles, carbines and revolvers that were used in the late war. In those early years just after the war, a breech-loading, single-shot metallic cartridge rifle would have been considered a real luxury and one that was only rarely seen on the frontier, so in the late 1860's a person who had in his possession a Spencer or Henry repeating rifle and a supply of ammunition to fit it was rarer still, and would have been worth his weight in gold in a fight.

After experimenting with quite a few conversion systems and producing some in fair quantities during 1865, in 1866 the U.S. Army adapted what was essentially a breech loading, metallic cartridge single shot conversion of the 1863 Springfield percussion rifle. Using a system invented by Erskine S. Allin, a master armorer at the Springfield Armory, this rifle used a breech that lifted up from the rear and hinged at its front. The U.S. M1866 fired a fifty-caliber center-fire cartridge called the 50-70; the rifle came to be called the trap-door Springfield; by 1873, the caliber was reduced to .45 and it remained in service through several improvements until 1892, well after most of the rest of the world's military organizations had gone to smaller-bore, high-powered repeating rifles. This is the same type of gun, albeit in the shorter carbine version that was carried by Col. George Armstrong Custer's 7th Cavalry troopers at the infamous Battle of the Little Big Horn. It has been alleged by some of Custer's apologists that many of the native American warriors were using some of the newest Henry and Winchester repeating rifles, and that the soldiers were simply outgunned. If the truth is ever known, it will probably be that, yes, a few warriors had repeating rifles, but of more importance is the idea that Custer was simply far out-numbered and very possibly out-soldiered by his so-called *savage* enemies.

1866 was our first full year of peace since 1860 and it saw the beginning of a new name in rifles; Winchester. Oliver Winchester, the wealthy New Haven financier who had been the original bankroll behind the Henry repeater had recently acquired that company and his new Model 1866 improvement on the Henry rifle was simpler to produce and much easier to load. Furthermore, Winchester was gearing up for the mass production of these rifles that would one day reach a scale even he had not imagined. But not everyone was convinced that these new-fangled repeaters were here to stay; after all, they were complicated and many folks making the

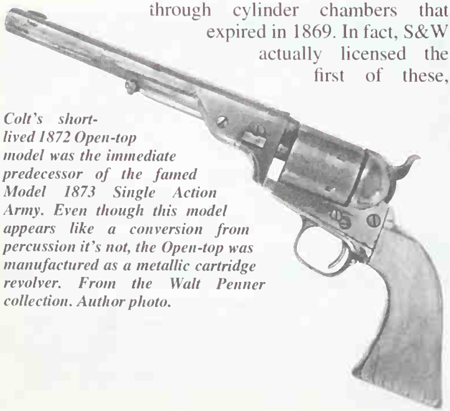


Here is closeup of an original Sharps percussion carbine of the type which saw such heavy service during the Civil War. The Sharps was not only extremely strong, it was also a breech-loader and lent itself very well to the conversion to fire metallic cartridges. From the collection of Ed "Buddy" Wade. Author photo.

Remington's rolling block was one of the most popular and largest selling military single shot rifles ever produced. This beautiful example of the Model 1871 U.S. Army rifle in 50-caliber center-fire was manufactured by Springfield Armory under a royalty license from Remington. From the collection of Ed "Buddy" Wade. Author photo.

conversion to metallic cartridge rifles decided to stick with a simpler, more dependable-appearing single shot. Lots of Civil War breech loaders such as the grand old Sharps were converted to use cartridges soon after the war for both military and commercial usage and quite a number of these, along with surplus Spencer carbines (which needed no conversion since they were already chambered for a rimfire metallic cartridge) made their way west with the new settlers. By 1867, Remington had introduced its now renowned Rolling Block, single shot breech loading rifles to a public that was anxious to buy such a "modern" rapidly-operated and easy to understand rifle. Two years later, Sharps introduced the first in a long-line of made-for-cartridge versions of their trusted, robust single-shot design.

Breech-loading revolvers other than the Smith & Wesson that would accept metallic cartridges began to appear just as quickly as that of the S&W/Rollin White patent on the idea of the bored-through cylinder chambers that expired in 1869. In fact, S&W actually licensed the first of these, some 4,574 caliber .44 percussion Remington Army revolvers that were converted to .46 Rimfire caliber in 1868 while their patent was still in effect. Colt's had many percussion revolvers left over from the war and not wanting to be stuck with a large inventory of this increasingly obsolete revolver design, they very much wanted to develop an inexpensive method of converting these existing revolvers so they could fire the new metallic cartridges. Even amid their on-going development of a more modern cartridge-specific revolver that would become the Single Action Army in only a few years, Colt was experimenting with several methods of converting their cap-n-ball revolvers to fire brass cartridges, beginning with the Thuer conversions of 1869, later the Richards and Richards-Mason conversions, and finally the 1871-72 *Open-Top* which was the first large frame they actually built specifically to handle metallic cartridges, and the immediate pre-cursor to their famous Model "P" Single Action Army or "Peacemaker" of 1873. In persistent efforts to deplete their inventories, Colt continued to produce their cartridge conversion revolvers in all frame sizes, selling them right alongside the newer model made-for-cartridge revolvers at least until the late 1870's.

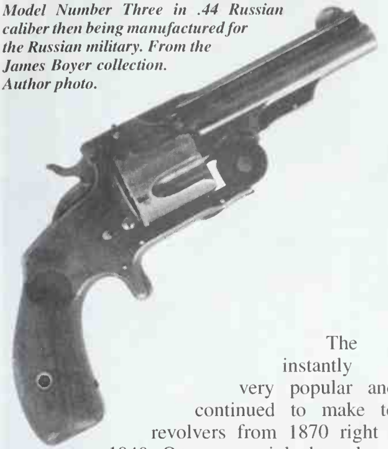


Colt's short-lived 1872 Open-top model was the immediate predecessor of the famed Model 1873 Single Action Army. Even though this model appears like a conversion from percussion it's not, the Open-top was manufactured as a metallic cartridge revolver. From the Walt Penner collection. Author photo.

Meanwhile there was Smith & Wesson; remember those two fellows who had introduced us to the metallic cartridge revolver in the first place. Up until now, they had been manufacturing only small-to-medium sized revolvers on their original 1857 plan, with barrels that tipped-up for loading. These tip-up pistols were made with a comparatively weak design and were only chambered for under-powered .22 and .32 rimfire calibers. Nobody knew better than they that their little guns would not be able to compete well with the revolvers soon to be released by the competition as their precious patent expired, so Horace Smith and Daniel Wesson went ahead and developed a new metallic cartridge revolver starting from the ground up, using an entirely different concept. This was the S&W .44 Model Number Three, introduced and submitted to the U.S. Army for testing in 1870, and it was a radical departure from any other revolver then on the market. A large-framed, top-break revolver, the Model Number Three was chambered for a powerful .44 caliber metallic cartridge using center-fire priming. The new weapon was called a top-break, because its design used a hinged frame whose barrel and cylinder tilted down after being unlocked for loading, thereby fully exposing the rear of the cylinder's chambers; at the same time the revolver's mechanism would automatically expel all the previously fired cartridge casings, thus offering the quickest in revolver cylinder reloading.

The U.S. Army bought 1,000 of these S&W's for field trials in 1871 and although they never purchased more, the gun that is now known by collectors as the *Model Number Three, 1st Model .44 American* made history by becoming the first official center-fire metallic cartridge revolver to be purchased by the U.S. Army.

The Smith & Wesson .38 single action as it was introduced in 1876, was known as the "Baby Russian" because of its mechanical similarities with the larger Model Number Three in .44 Russian caliber then being manufactured for the Russian military. From the James Boyer collection. Author photo.



The design instantly became very popular and S&W continued to make top-break revolvers from 1870 right up until 1940. Our army might have lost interest, but other world armies, notably Russia's, took quick notice of this amazing new S&W with all of its automatic features and soon entered into a long-term, profitable relationship with Smith & Wesson that would prove very beneficial to both.

Colt kept their work force busy immediately after the Civil War by filling large contracts with the Russian government for Colt-Berdan single-shot rifles. By 1873, the .45 center-fire caliber Colt Single Action Army, or what some call the Peacemaker had been adopted by the U.S. Army as the official sidearm; its popularity, its future and its place in history was secured, better than anyone then could know. That same year saw the birth of the classic Winchester Model of 1873 rifle, with its new and more powerful .44 cartridge that we have come to know as the 44/40.

The latest replica of a 19th century S&W top-break is Navy Arms New Model Russian. Chambered in .44 S&W Russian caliber, modern ammunition is being manufactured by Black Hills. Revolver courtesy of Navy Arms. Author photo.

The Winchester 1892, designed by John M. Browning, offered a brutally strong rifle action in a very compact space. This particular rifle is the take-down variation. Author photo.

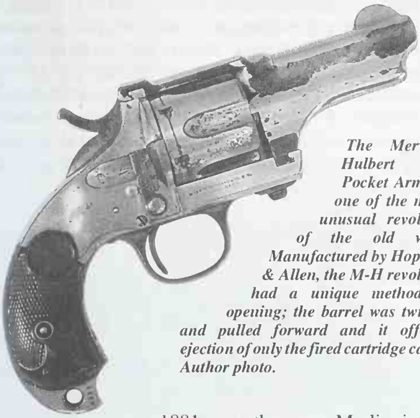
This was followed by the large-framed Model 1876, which was their first hunting rifle that could accept heavy caliber cartridges intended for big game. Not surprisingly, Colt expanded quickly, adding a plethora of small and medium sized-cartridge pistols during the 1870s, with medium-sized double-action revolvers in .38 and .41 caliber in 1877, and a year later they offered the full sized Double Action Army model of 1878. Beginning in 1883, Colt introduced its own lever action rifle, the Colt-Burgess and the next year their Lightning Model medium-framed slide-action rifles hit the streets.

The grand old Whitney Armory which had produced so many percussion weapons before and during the war was struggling to compete, but managed to introduce two breech-loading designs similar to the Remington Rolling Block. They also manufactured a line of small rimfire pocket revolvers, and no less than three separate lever-action rifle designs between 1878 and 1888 when Eli Whitney III sold the failing company to Winchester. There was a large, waiting market for new firearms in the 1870s and 80s, so the big names were joined by many other, smaller companies. One of the more interesting of these was Merwin Hulbert & Co., who was not an arms maker, but actually a large arms dealer and distributor in New York, the successors to Merwin & Bray of Worcester, Mass. who had a series of unique twist-barrel, selective-ejection cartridge revolvers manufactured for them by Hopkins & Allen at Norwich, Conn. The Merwin's were made from the about the mid 1870s until the late 1880s, and were some of coolest operating revolvers ever made. M-H revolvers were made in many calibers from .32 to .44, in three basic frames sizes, and were offered as single or double-actions.

Sharps, of course, easily made the transition into metallic cartridges since their single-shot rifles were already true breech-loaders. After the war, this company continued to make single-shot rifles of exceptional quality under the able direction of Richard Lawrence; however, the repeating rifle writing was on the wall and Sharps company officials never would admit it. By 1878, sales were lagging badly behind and a new design

Our Modern Desperado, champion cowboy shooter Ed "Buddy" Wade as *Jake Slade*. *Jake* is well armed with his Model 66' lever-action carbine by Uberti in .45 Colt caliber. Partially hidden in a cross-draw holster is an original Smith & Wesson .45 Schofield. Ed Wade photo.

was introduced, possibly the most modern single-shot rifle produced until that time; the Sharps-Borchardt. This thoroughly modern, hammerless single-shot was designed by the same Hugo Borchardt who would later become famous for designing the mechanical basis of the Luger pistol. The Sharps-Borchardt was a wonderful rifle, but it came too late for Sharps, who closed the doors of the Bridgeport factory for the last time in 1881.



The Merwin-Hulbert .44 Pocket Army is one of the more unusual revolvers of the old west. Manufactured by Hopkins & Allen, the M-H revolvers had a unique method of opening; the barrel was twisted and pulled forward and it offered ejection of only the fired cartridge cases. Author photo.

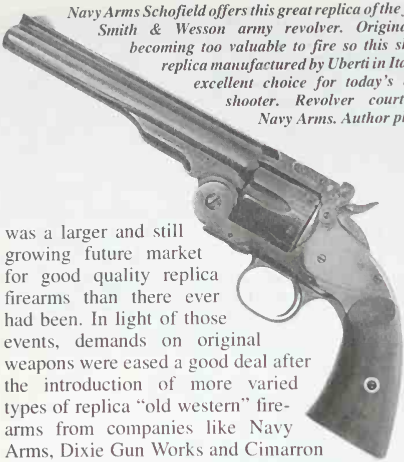
1881 was the year Marlin introduced the first of their long-lived lever action rifles, the Model 1881. The popular rifle spawned an entire series of small, medium and large-framed lever-actions that are still made to this day. Marlin had manufactured various rimfire derringer types and pocket revolvers from about 1863 until the late 1880s; some of these were simplified copies of the Smith & Wesson tip-up revolver. In 1875, John Marlin took over the production of the well-known Ballard single-shot rifle and manufactured it in numerous variations until 1891.

America's oldest gunmaker, Remington made many forms of cartridge weapons as well as their best known Rolling Block rifles and pistols. It is probable that with over than a million made, more Rolling Blocks were produced in the last century than any other metallic cartridge single-shot military rifle. Between 1880 and 1907, Remington also manufactured a very highly regarded single-shot known as the Hepburn. This falling-block rifle was designed by the head of their mechanical department, Lewis Hepburn, to be a strong, simple and high quality target rifle. Some of the better known cartridge revolvers are Remington's models 1875 and 1890 single-actions which rivaled the Colt Single Action Army in size and power, but were never really serious competitors. From 1869, to the turn of the century, the Illion, New York based factory, also turned out a large line of small and medium framed revolvers in several styles as well as several variations of pocket pistols and derringers, the most famous of which being the .41 rimfire Remington Double Derringer, which was introduced in 1866, with likely over 150,000 made through 1935.

This broad overview doesn't even begin to include all the other, lesser known gun makers and brand names of which there were hundreds, impossible to catalog, but nevertheless, all of whom made or sold the guns that played some role in the winning of the west. Nor does this attempt to guess at how many people bought war surplus firearms from the hundreds of thousands left over from the Civil War and sold thereafter at incredibly discounted prices, indicating that a great many more of these kinds of weapons were involved in the western expansion than has been supposed.

Guns of the new west: Not so many years ago the American public's obsession with the old west inadvertently spawned a new shooting sport that came to be called Cowboy Action Shooting (CAS) and which in recent times has gained incredible favor with the shooting public. Since this popular sport demands that its participants use only guns that would have been used on the frontier (or the replicas of guns of that type), the beginnings of these activities placed heavy physical demands on the original frontier-era weapons used by many competitors. During the early days of CAS in fact, more than a few original firearms were damaged or ruined during the hard courses of competition in cowboy-shooting events. With ever increasing demand and those shrinking numbers of original weapons of course, came rising prices. Clearly, there

Modern replica arms companies are going to a great deal of trouble to make a vintage looking presentation. Here is the box the Navy Arms Schofield comes in. Courtesy Navy Arms. Author photo.



Navy Arms Schofield offers this great replica of the famous Smith & Wesson army revolver. Originals are becoming too valuable to fire so this shooting replica manufactured by Uberti in Italy is an excellent choice for today's cowboy shooter. Revolver courtesy of Navy Arms. Author photo.

was a larger and still growing future market for good quality replica firearms than there ever had been. In light of those events, demands on original weapons were eased a good deal after the introduction of more varied types of replica "old western" firearms from companies like Navy Arms, Dixie Gun Works and Cimarron Firearms, to name a few. Today, replica firearms will often be seen in greater numbers than original arms at most cowboy competition events. I have no idea who coined the phrase, but I have heard the sport, and the folks who participate in it, referred to more than once recently as "the new west." Indeed, there are so many replica arms that come in so many varieties, we ought to stop right here and properly re-name these replica firearms the guns of the *new west*.

What are the guns of the *new west* and who makes them? The first replica arms in any quantity to appear in the United States during the 1950s, were copies of percussion muskets and revolvers that could be used by Civil War reenactment groups. Later there appeared a growing shooters-market for Colt Single Action, Sharps and Remington rifle replicas which was soon expanded to include clones of the early Winchester lever actions. Today, there are replicas of many more 19th century firearms, and with more being released each year it can get hard to keep track of them. The entire gamut, it seems, of percussion revolvers, is covered nicely including Colt, Remington, Spiller & Burr, Starr and many others with only the 1855 Root revolvers omitted from the Colt clone lineup. The world of replica cartridge firearms has been expanded hugely during the 1990s with the additions of the Rossi manufactured 1892 rifles, Navy Arms Uberti-made Smith & Wesson look-a-likes of the classic Russian and Schofield single-action top break revolvers, Cimarron Firearms beautiful Uberti-made, 1872 Open-Top revolvers, a Spencer rifle replica and the soon-to-be replica 1887 Winchester lever shotgun not to mention the many variations on the Colt Peacemaker theme which are available from several importers and even a couple of U. S. manufacturers, including it's parent company. Located in Chapter 9 you will find much more source information on the popular replica arms-makers and importers who are doing business today selling guns of the *new west*.

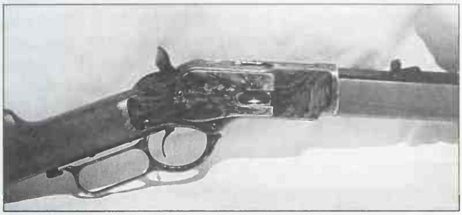
This inspectors cartouche looks like an original but its not, in reality this is the left grip on the Navy Arms Schofield sporting a darned good reproduction of inspector David A. Lisle's initials as were originally used on the military version of the 2nd Model S&W Schofield. Author photo.

Here is a close-up of a well-restored 1873 Winchester showing color-case hardening, nitre and slow-rust bluing. "This high standard of beauty and quality required far more parts to be made with a higher degree of precision machine work than most modern arms do...In short, this kind of intense machining and hand workmanship is just too-doggoned expensive to reproduce in quantity today." Author restoration and photo.

I've heard the groans of disappointments from a good many folks as they talk about the state of modern replica firearms in general. In some aspects, those folks are right; we all know there are many ways the guns of the *new west* do not measure up to their original counterparts, although in other ways, and I have to be honest here, the modern copies in general are so much better. You won't ever be able to compare the exquisite fit and finishes of the old weapons to today's variety for the simple reason that, except in rare instances, the general public can't *(or won't)* afford to pay for that kind of hand-work in this day and age. What then, does that make the replica any less of a gun than the original? Well now, that depends on how you measure them up and what your intentions for the firearm are, doesn't it? There are some cases where that may depend on the quality of the replica firearm, a few of which have not been noted for their excellence of quality. If you are after a lever-action with that beautiful 1870s Winchester

fit and finish because you appreciate that kind of quality and like to look at it, there is a simple answer for you; go out and buy yourself a nice collectable 1873 Winchester and be done with it. However, when your intention is to actually *use* that Winchester in what may well be a grueling competition where the gun can be subjected to damages and very heavy wear and tare, then by all means, you should look to the replica as the gun that will be the most likely to best fill your needs.

Over time we have found some impressively sound reasoning for recommending replica firearms over the originals to people who are interested in getting serious about shooting these frontier-era guns. Let's see; first the modern manufactured replica firearm provides you with the look and feel of an original 19th century



1873 Winchester's 1873 was surely one of the most famous of all western era rifles. This copy by Aldo Uberti sports a pretty color case hardened frame and exhibits some very fine wood to metal fitting. Rifle courtesy of Uberti USA. Author photo.

weapon, usually for a lot less cash outlay than an original. Then, in most cases, the replica is made from modern steel alloys which are almost certain to be much stronger and more durable than an original (all rumors about Italian steel quality aside; even a low grade, soft-modern European made steel alloy is in most cases a better product than any 1880s gun steel.) Having repair work done on original weapons can also run into some serious money, because most modern gunsmiths simply don't have the expertise, and competent experts in this field are few and far between. Original spare parts for these old beauties are costly and just as often, non-existent. On the other hand, more and more gunsmiths today are taking the time to learn how to repair the popular replica weapons that are being used in cowboy competitions simply because these guns are beginning to show up in their shops, and new spare parts to fit them are, for the most part, readily available from their manufacturers and importers.

For my final sound reason, and if the others haven't already convinced you, I think this one is of much greater importance than all the others; there will always be only a limited and unfortunately, ever-declining number of these original weapons in existence, so if you ruin a good original 19th century firearm; it is gone and there will be forever one less. Your average modern replica firearm however can be replaced with another one exactly like it.

Quality and not. . . The lion's share of modern replica firearms are being made by several European manufacturers with the majority of these located in or around Breccia in Italy. Some are made with better quality than others, but here is what I have to say about them in a generalized nutshell: Most replica arms sold today are of very good quality and will at least, posses *potential*, thus they can make a sound basis to build on. I did not, you will notice, say that most replica guns are of excellent quality, which would have inferred that most of them were useable for cowboy action competition *right out of the box*, although recently I have seen more than a few that were. What I said was that. . . *most are of very good quality and will at least, posses potential, thus they can make a sound basis to build on,* meaning that the basic firearm is a well-built platform but that "as is" it's probably not fitted very well mechanically, so it is more likely than not that the newly made replica firearm

Winchester's Model of 1885 single-shot was the first of John Browning's excellent designs to be purchased by the arms-making giant. Shown here is Aldo Uberti's reproduction of the 1885. This is a stunningly beautiful rifle that also shoots very well. Rifle courtesy of Uberti USA. Author photo.

The president and founder of Navy Arms, Val Forgett (right) is a real innovator in the replica firearm industry. Forgett and his general manager Paul Reed, have had a great deal to do with both the quantity and the ever-improving quality of imported replica firearms that are available to American shooters today. Bullet 'N Press photo.

will require the talents of some skilled gunsmith's hand in order to unlock its full shooting potential.

Now, this would be where *you* come in.

Understanding Black Powder

What exactly is black powder?

Black powder, which is also known simply as "gunpowder," is considered a "low explosive—propellent." Technically, it is a mechanical mixture of potassium nitrate (salt peter), sulphur (brimstone), and charcoal, although the exact proportion of these ingredients has varied widely for its application to various different uses over the centuries. For use in small arms however, the best known gunpowder composition remains 75 percent of potassium nitrate, 15 percent of charcoal, and 10 percent of sulphur. Writing in the early 1600s, John Bate gave the following, very accurate, accounting of the ingredients that make-up this hellish mixture, *"The salt peter is the Soule, the sulphur the Life, and the Coales the body of it."* In our terms, the salt peter (potassium nitrate) supplies the oxygen which enables the charcoal *(coales)* to burn *(the Soule and the body).* Bate correctly calls the sulphur the *"Life"* because it catches the *first fire*, and since it is intimately mixed throughout, it communicates the fire, spreading it in an aggressive and lively manner to the entire mixture.

One corner of the Navy Arms retail store which is located in Ridgefield, New Jersey. Navy Arms is primarily a wholesale mail-order business, but their small retail store is stuffed with hundreds of shooting replica rifles, pistols and shotguns; it's worth a visit. Bullet 'N Press photo.

Powder grains. Black powder grains are hard and are not porous. The sulphur has colloidal qualities; put into other words, it has the tendency to fill any unoccupied space in the mixture easily. Some chemists have described the sulphur in gunpowder as its bonding agent because of these properties. Black powder is described as a progressive burning mixture, due to the fact that the individual grains are poor conductors of heat. When black powder grains are ignited, they burn progressively from the surface; the surface area of the burning grain decreases as the burning advances, causing the grain to become progressively smaller, as the rate of gas production increases. The whole duration of the burn will depend entirely upon the size of the original powder grain. Here the rule of thumb is; smaller grains burn more quickly than larger grains.

When black powder burns. Extensive experiments performed as early as the 1870s showed us that when black powder burns it produces an average of 43 percent of its weight in gases (translate this into *usable energy* in a firearm), about 56 percent remains as solids, (residue; that mess left in the barrel after a shot is fired), and about 1 percent is water. The great cloud of white smoke which appears after a black powder discharge is composed of minute particles of solid matter which are being held temporarily in suspension by the hot gases of combustion. Remember, the weight of those particles that make up the smoke cloud is more than 50 percent of the original weight of the powder charge. Conversely, "smokeless" powder uses almost 100 percent of it's original weight, turning this into usable energy (combustion gases); thereby producing almost no smoke. Gunpowder contains a large percentage of a chemical salt (potassium nitrate), so it is said to be *hygroscopic*. What that means is that it will readily absorb moisture from the air. For this reason, black powder has for a very long time been produced with a glazing added to the powder granules after their manufacture with graphite; this treatment helps to deter that undesirable side effect.

FFFg grade black powder. "The whole duration of the burn will depend entirely upon the size of the original powder grain. Here the rule of thumb is; smaller grains burn more quickly than larger grains." Author photo.

The grading of black powder: Earlier we mentioned the different sizes of gunpowder grains, and about how smaller grains will burn more quickly than the larger ones. The term "grade," when applied to gunpowder refers to the grain size, and *not* to its quality. There are two separate categories of gunpowder grades; "C" and "F" grade. "C" grade is for cannons and large capacity explosive devices. A single "C" being the largest grain size with smaller sizes graded down as,

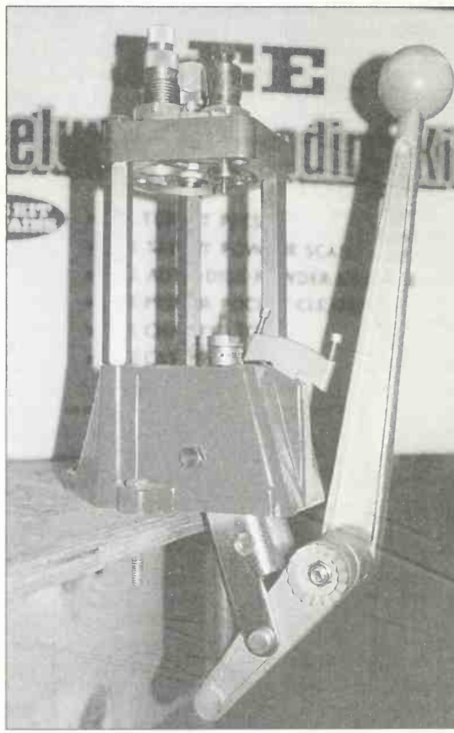
"CC," "CCC," etc. Powder that is meant for small arms purposes uses the letter "F" to denote the grain size with a single "F" (or 1-FG for "1FG" size, "F" grade grain). The more "F's" you see within the powder grade designation, the *smaller* will be the grain size. "FFFG," for example, is very fine, almost a dust and was commonly used as a priming powder for the pans of flintlocks.

Black powder and chamber pressures: We tend to think of black gunpowder as a "low Pressure propellent," and indeed the uses small-arms shooters will put it to all fall within the range of 10,000 PSI to 25,000 PSI chamber pressure. But friends, let us not make the mistake of assuming that plain old gunpowder is not capable of generating greater chamber pressures than those. In tests that were conducted by Nobel & Abel during the 1870's, and then more recently by the United States Navy, results in both cases showed clearly that under the right conditions, black powder is indeed capable of producing in excess of one hundred thousand pounds per square inch! That is a huge amount of chamber pressure. . .certainly more than enough to completely wreck just about any common small arm.

How much black powder to use? First of all, if you are in any doubt as to the exact powder charge to use in your muzzle loading firearm, or in a black powder cartridge gun, don't hesitate for a moment to contact the gun's manufacturer (if it's a modern made gun), or take the time to research the subject thoroughly from any one of the various books relating to black powder shooting. This information is not hard to find, there is even an entire section that has been thoughtfully devoted to this topic in the back of the Dixie Gunworks catalog. Whatever you do, please do not automatically assume that you cannot "blow-up" your muzzle loading firearm with black powder because you think it doesn't have the potential energy to do damage; that assumption could be a big mistake. It is also very important to know just how much to compress the powder charge in a metallic cartridge and we will get into this below.

Compressing the powder charge. Another area we will just touch on is that of *seating* the powder charge or powder compression. A loosely charged barrel, that is, one where the charge has not been seated all the way down against the back of the barrel's chamber, leaves the gun with a dangerous void or air space between the rear of the chamber and the powder charge, which upon ignition, may very well explode the barrel. When charging any muzzle loader, and this statement grows especially more true with the smaller bore rifles, one must be very careful to fully tamp the ball and powder charge firmly so that you are certain it has been seated all the way down against the rear of the barrel's chamber. Also, even when it is used in cap-n-ball revolver cylinders or in brass cartridges, the black powder charge requires a certain amount of compression from the projectile. This powder compression compacts the charge together somewhat and so adds greatly to the uniform burning of the whole powder charge, normally increasing the muzzle velocity in the bargain.

Powder compression in metallic cartridges. Those who try and duplicate the original black powder cartridge loadings with modern, solid-head brass cartridges casings will be disappointed to find that the newer style cases, while they are far stronger than the old balloon-head cases, do not hold as much powder. For instance, where you were to charge a solid-head .45 Colt case with a full 40 grains of black powder, (even if you used an extra long drop-tube and settled the powder grains really well); your case would by brimming to the point of spilling over. With that much powder, where and how do you seat the bullet? The only answer is that you don't! To try and force the bullet in on top of all that powder you would be compressing the powder charge too much, and if you actually did successfully seat the bullet, the force required to do so would have formed the powder grains into, what in time, will become one solid mass of powder.



With the leverage offered by modern reloading presses, even one like the little Lee shown here, it is possible to exert tremendous pressure on the bullet, making it easy to create a dangerous, over-compressed black powder charge, especially in revolver-sized cartridges. Author photo.

Understand that some compression of the black powder by the seated bullet is a normal and even desirable situation with metallic black powder cartridges. A small amount of powder compression removes the chance of leaving an air space as we mentioned earlier when speaking about muzzle-loading arms, it also enhances uniformity of ignition and may raise muzzle velocity slightly. We are, however, talking about a mild amount of compression, and not the large degree described above and below.

Earlier I mentioned the old U.S. Navy tests with black powder where pressures in excess of 100,000 PSI were generated. There is a phenomena which occurs when black powder is compressed too much, it becomes primarily one solid mass of gunpowder instead of individual grains. So then, what the Navy discovered was when an over-compressed mass of black powder was ignited it would produce pressures that pretty much went right off the scale. That in itself sounds like it might be a useful discovery, the only problem is that when black powder is compressed to that degree, it also becomes highly unstable and unpredictable, and tended to detonate rather than burn. The author discussed this phenomena with the president of GOEX powder Company, Mick Fahringer, several years ago, and he agreed with the Navy's conclusions, adding that no one really understands exactly why this happens or what goes on when black powder is compressed like this, but that it certainly produced dangerous results.

By all means, when you are loading the powder into your black powder cartridges, factor in enough room for the bullet to be seated comfortably, so that when it is fully seated it will compress the powder charge from 1/16" to 1/8" . . . and no more. In the instance of the .45 Colt we offered above, the correct loading for use with modern, solid-head cases would be approximately 35 grains of black powder. The exact amount of powder required to achieve the desired compression will vary depending on the case make (capacity), powder density, bullet-seating depth and bullet type. To help you safely get the maximum amount of black powder into the case, make a practice of pouring it through an extra long drop-tube.

Black powder or smokeless?

More and more first-time shooters are becoming involved with the exciting new Cowboy Action Shooting sports and that's great, because these action sports are proving to be wholesome clean fun. Unfortunately, many shooters, especially those who are not yet very experienced, are making the all-too-common mistake of using smokeless powder ammunition in original metallic cartridge firearms, especially in revolvers that were intended for black powder cartridges. Some shooters use reduced charge smokeless powder re-loads, or factory smokeless ammunition in their 1800's revolvers, and they claim not to have seen any trouble from it . . . yet.

As a specialty gunsmith who has been working on these Victorian era firearms since long before there was a sport called Cowboy Action Shooting, I'd like to pass along just a few words of caution. I'll get arguments on this opinion of mine, which is simply stated: do not use smokeless ammunition in 19th century revolvers. Here is why I feel this way. I have seen more than a few old revolvers (manufactured in the 19th and into the early 20th century), some that were truly priceless, which had been ruined while they were being fired by shooters who were using smokeless powder ammunition. That has caused me to take note of an alarming set of similarities. For years, revolvers from this era have been coming into my shop with signs of damages that could be directly attributed to the use of smokeless powder ammunition, but much more so in recent times, since the above named shooting sports have gotten to be so popular.

These high quality modern-manufactured cartridges are designed to fit into modern replica revolvers and will also chamber in antique revolvers. Because they are loaded with smokeless powder, the author strongly discourages their use in original firearms. Author photo.

An alarming trend. These damages might be something as obvious as a blown or a cracked cylinder, although more often the damage is not nearly so obvious. A common sign that there is a problem related to incorrect ammunition occurring in an old revolver is when we see it developing timing problems along the way. Usually those timing problems are in turn being caused by excess cylinder end-shake (see Glossary) and/or a loose barrel-to-frame connection (in jointed frame revolvers.) Upon more careful examination, many of those guns will eventually prove to have badly

stretched frames as the result of someone firing the gun with smokeless powder ammunition on a regular basis. Almost as often we run into revolvers whose cylinders wobble badly from side to side, and we find very slight chamber bulges which have partially expanded the cylinder around its base pin hole. It's not difficult to trace these sort of damages right back to the ammunition that the owner was using. Coincidences all? From long experience, I think not.

It sounds a bit like all those people were shooting heavy hand-loads in those revolvers, and in a very few of the instances that is exactly what they were doing. However, in the great majority of these ammunition damage cases we found that the shooter was using new, factory assembled smokeless powder cartridges, or else carefully prepared hand-loaded ammunition that was loaded to a point below the levels of modern factory specifications by an experienced ammunition re-loader. Ammunition which, for their limited knowledge on the subject, they believed *should have been* perfectly safe.

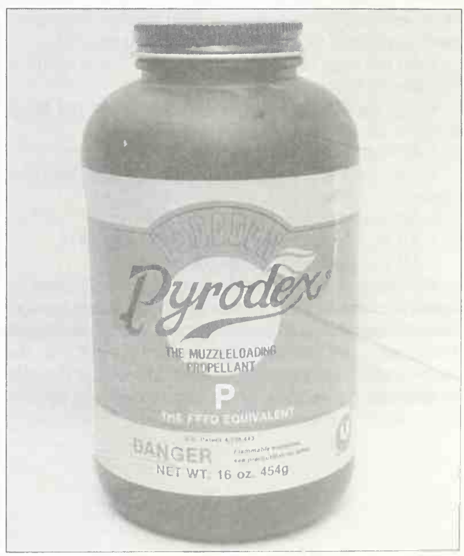
19th century gun steel. We could find you the technical reasons for these phenomena, but why bother? It isn't often that any two experts can agree on the same cause any way, especially on this subject. The bottom line will always be that by our standards today; the steel in those guns was lousy. Nobody (not even the vaunted gun companies), knew a great deal about the internal structure of nor the manufacture of homogenous steel alloys before right around WWI as a result, in quick and dirty layman's terms; the steel used in the manufacture of these lovely old guns is just not very high quality. In my experience, old gun steels, no matter how wonderful the quality of the craftsmanship that is displayed in the gun itself, it cannot withstand a continued diet of smokeless powder cartridges without sustaining some degree of damage. We find it interesting to note that these same black powder era, metallic cartridge revolvers, will shoot for years, digesting thousands of rounds of ammunition with little or no trouble, and with nary a sign of damage when they have been fed an exclusive diet of black powder ammunition.

What black powder era firearms can be particularly vulnerable to damage by smokeless ammunition? Actually, anything made in the black powder era is at least somewhat vulnerable to be damaged by smokeless powder ammunition. Some arms are much stronger than others; Colt Single Actions for instance, seem to stand up fairly well to the effects of smokeless, although we have seen some that were damaged and a few that had been ruined. I would advise extreme caution with 1873 and 1876 Winchester lever actions, these guns look fairly robust and they have a reputation for being tough, but they won't stand up to very much abuse from ammunition. Winchester's Models 1886 and 1892 do extremely well; these are based on a tough, John Browning design that is, like a good 98' Mauser, strong in spite of the steel quality because of its excellent, overabundant design.

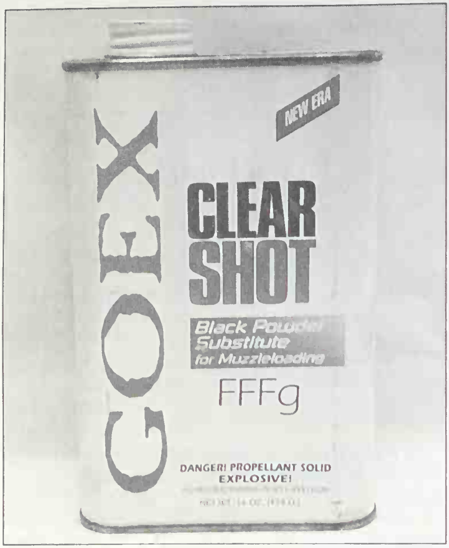
Black powder is still manufactured in the United States by GOEX; this is an older can of their FFFg black powder. Author photo.

On the *never use smokeless* list are:

- All original flint lock or percussion muzzle loading firearms.
- All Colt manufactured cartridge and cartridge conversion revolvers which are based on the percussion frame, including the Model 1872 or open-top.
- All the Merwin Hulbert revolvers. These are especially fragile. We say especially because these designs



Hodgdon Pyrodex was the first black powder substitute to be offered and it is available in several grades. Here it is shown in the "P" grade which approximates FFFg. Author photo.



The latest black powder substitute on the market is GOEX Clear Shot. Based on what the author has seen so far, this one looks like a winner. Author photo.

all use minimal amounts of steel around the cartridge chambers and the fact that the steel used in these guns has shown itself to be of highly inferior quality.)

- All the large frame, Model Number Three Smith & Wesson top break revolvers.
- Any small or medium Smith & Wesson top break revolver made before about World WarI.
- All Starr revolvers.
- All pre-1900 Remington cartridge and cartridge conversion revolvers.
- All Henry rifles.
- All Winchesters Model 1866, 1873 and 1876.
- All shotguns with Damascus barrels.

By using factory ammunition, you won't have to spend the time nor the trouble of loading black powder ammo. After all, in many instances boxed-smokeless ammunition is conveniently available right off the dealer's shelf. Of more importance to most, is the idea of omitting the tedious, dirty, smelly clean-up process that comes after every black powder shooting session, but at what cost this convenience? Would you want to take the chance of ruining a revolver that may be worth several thousand dollars in today's collector market? I don't. I cannot think of anything that would take all the fun out of my day faster than blowing up a Smith & Wesson Schofield that had been valued at $10,000, and all because I was trying to save time, keep my hands clean and pinch a few pennies. Forgive the pun, but in the interest of preserving those original Victorian era revolvers, black really is beautiful. If you just can't or you won't deal with having to load and shoot black powder ammunition, I sure hope you will consider retiring the old gun, and that you will go buy yourself a modern replica that will be safe to shoot with modern smokeless ammunition.

Smokeless powder is a "no-no" for use in most 19th-century firearms. Author photo.

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Black Powder Charges: Handgun Cartridges

Caliber	Bullet weight in grains	FFFg weight in grains (BHC)	FFFg weight in grains (SHC)	Muzzle Velocity F.P.S. (Approx.)
.32 S&W	88	10	8	810
.32 S&W Long	100	13	10.5	850
32/44 S&W	83	11	11	N/C
32/44 S&W	50 (ball)	4	4	N/C
.320 S&W	100	17	17	N/C
32/20 WCF	115	20	17.5	875
.38 S&W	146	15	13	790
.38 S&W	71 (ball)	6	6	N/C
38/44 S&W	146	20	20	N/C
38/44 S&W	71 (ball)	6	6	N/C
.38 Long Colt	150	18	16	760
.38 Special	158	21	19	850
38/40 WCF	180	40	33	940
.41 Long Colt	180	no data	21	710
.44 American	200	25	22	N/C
.44 Russian	246	23	20	725
.44 Special	246	26	24	775
44/40 WCF	200	40	33	985
.45 S&W	230	28	27	875
.45 Colt	250	40	35	975
.450 Webley	225	13	11	N/C
.455 Webley	265	18	15	720

BHC: Balloon Head Case, **SHC**: Solid Head Case, **N/C**: not chronographed, **FPS**: Feet Per Second.

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CHAPTER 2

The Gunsmith

What is a *Gunsmith* anyway? Up until early in the twentieth century anyone who had the term *"Smith"* hanging after their name, had was considered to be a well respected and important person; in fact, once it meant as much or in some instances even more than a doctorate does today. The title or name "—smith" used after a tradesman's name in former times signified that this person was a "master" in their chosen and honorable field of endeavor.

Simply put, the "smith" knew all that there was to know about his trade, and was fully capable of accomplishing each and every aspect of it all by himself if need be, or as was most often the case, of directing others in a shop or factory, from the founding of the raw ingot of iron to the finished, rifled and engraved gun barrel; or, from the trunk of a walnut tree to the beautifully fashioned, carved and checkered gunstock. If we thought of it in today's terms when referring to a gunsmith, this person might be called a sort of master engineer, designer, tool maker, welder, carver, chemist, joiner, mechanic and fabricator; all rolled up into this one *super-craftsman* package known simply as a "smith". It can truly be said that there are few alive in our time who could hope to fill the shoes of such craftsmen as existed in centuries past.

Just to give you a small idea of the amount of effort it took to be a successful gunsmith: First, you had to know all about firearms design, the how and why of what made everything work in all sorts of weapons. In the age when few if any replacement gun parts were available, the gunsmith had to be a first class master machinist, so that he could manufacture any unique parts or pieces of a firearm which might require replacement. However, before those unique parts could ever be manufactured, it often fell to the "smith" to design and make both the hand and the machine tools he would require to fabricate the parts. Our "smithy" had better know a good deal about metallurgy as well, for he would have to know without question exactly what sort of steel would work the best for the job at hand, then how to harden and temper the springs and parts he made from scratch, and to case harden the moving parts against wear.

The gunsmithing profession crossed many lines of trade, for instance into black-smithing so he would know how to forge and heat-shape certain parts of a gun from raw iron bars. Then he had to be something of a foundry-man, for sometimes he would be asked to cast oddly shaped gun parts from iron and brass. He would also have to learn a good bit of chemistry, for there was always the chore of having to make his own metal coloring solutions and wood finishes in order that the weapons not only look good, but were properly protected from the elements. Many of these solutions were exotic "witch's brews", developed by long experimentation and composed of highly poisonous chemicals; the formulae were among the gunsmith's most closely guarded secrets.

Oh yes, last but not least, there is that hallmark of the arms trade: the gunstock. The olden gunsmith was very often the consummate woodworker, having a master's knowledge of the prop-

Dave Says...

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Read the instructions!
About your bench and work space
Vises
The rifle vise or gun cradle
Lost parts and the captive disassembly box
Store-bought tools

erties of all the different hardwoods which might be used in firearms, and that included knowing all aspects of how to work with these woods in minute detail, literally at times following the wood from the living tree on into the finished gunstock. That "smith" had to learn how to select the correct part of the correct tree, how to cut it down, how to dry it and then how to saw out only the best pieces for use as gunstocks. With very few exceptions, there were no off-the-shelf replacement gunstocks, and those few that existed would have required large amounts of hand-fitting. Think of it, some of the early long rifles had barrel channels that were four feet long and more; every square inch of it hand-fitted and mated with perfection to the steel barrel. We have seen some barrels so well fitted to the wood that if there weren't a difference in materials (from wood to metal) you would be hard put to find a seam with the naked eye. Of course, after all the fitting and shaping, there was something of the knowledge of fine furniture finishing involved with achieving a beautiful surface finish that, because the firearm would probably be used and handled heavily, had also to be very durable.

As you can imagine, it took quite a long time for a young person to learn something of the skills from all these different professions and even more time to perfect those skills. The old process of learning worked like this: The only place you could acquire all of this was to get it first-hand from an established master gunsmith and you did that by signing-on and working for this gentleman as an apprentice for many years. Often your family would "sign you on" as an apprentice when you were a boy of ten or twelve, this, of course, occurred only after they had received some sort of financial consideration from the tradesman. In many cases, you became what was basically an indentured servant to this tradesman for a specified number of years. In payment for all this servitude, he agreed to give you room and board and to teach you his trade. At the end of the period of service which might have lasted for ten or fifteen years, (if you had proved satisfactory), the tradesman would supply you with a tool kit and a letter telling all that you had fulfilled your apprenticeship term and were now a true and qualified "smith". In pondering those rather severe terms, I have wondered what might have happened to the poor apprentice if he had not for some reason, proved "satisfactory" to the master or what if the tradesman simply didn't like him?

There is one thing for sure: Iif the apprentice didn't do his work well or correctly, the faulty work would quickly be rejected by the "smith" and the lad would be compelled to do it over, and over. . .for as many times as it took until he finally got it right. To compound the underlings plight, these rejected or ruined items would often be charged to the apprentice's account! Now, as harsh as all that sounds there was an up-side; the guarantee of a penalty for producing poor work instilled an ethic into the apprentice's work habits that he would never forget: "Shoddy work is not acceptable, so I have to do it right, no matter how long it takes".

Lastly, a significant, yet probably unspoken part of this long learning experience should have been that our (you fill in the blank) — "smith" must have acquired a sound sense for business from his mentor, that is, if there was to be any chance at all for his long-term success. This latter skill, or more correctly, the lack thereof, has too often caused the demise of many an otherwise excellent master tradesman. Sadly, this has not changed, even into modern times. History has given us some examples of gunsmiths who have not only succeeded in their trade, but went on to build fortunes. Among these glaring success stories were gunsmiths like Horace Smith, Daniel B. Wesson, John Marlin, Eli Whitney and Eliphilet Remington. The arms giant Samuel Colt wasn't really considered a gunsmith, but he was an inventor and entrepreneur of extraordinary quality; he was also one of the few who had the aptitude and good sense to have learned a lot from the gunsmiths he encountered along the way. Oliver Winchester was probably the farthest thing from being considered a gunsmith;, he did however have a wonderful genius for business, creating one of the largest firearms empires ever. There is an irony in the fact that one of the reasons for Winchester's having the means to make his fortune in the first place were the ideas of a truly brilliant gunsmith/inventor named Benjamin Tyler Henry. Although Henry had both a rifle and a cartridge named after him, he never had the business savvy to compete with his partner, eventually losing control of the business to Winchester and fading into the sidelines; years later he died a struggling gunsmith in virtual obscurity.

The gunsmith's work ethic: Our modern gunsmith has probably learned his trade under very different circumstances and yet one idea remains constant from the days of the apprentice, that of the work ethic. In the medical profession young professionals are taught to begin their day with the simple, yet powerful adage *"First, do no harm."*, and that my friends, is wonderful advice for any professional or amateur craftsman to follow, quite regardless of the undertaking you are about to attempt. The first real steps you will take in gunsmithing will be in the dissection of old guns; it is here that we must learn the art of how to get them apart and back together again in a *professional manner*, that means you have to do it without creating even more of a mess than you had before you started. To do this, there are certain procedures which you will want to follow which will better allow you to perform a professional job, and of course, in all cases to avoid doing even more damage to this cherished old piece. Who knows, if you take enough care with your work, you may even make yourself look good in the process.

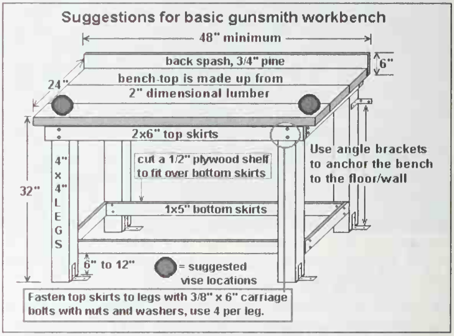
Let's begin by asking ourselves; "Do I feel that I am competent enough to attempt this work without doing even more harm to the firearm than has already been done?" There is no one that will be able to answer that question honestly except yourself. If the answer to the question is no or if you aren't sure, then by all means listen to yourself. It might be a very different story if you were out to disassemble a modern, plastic and

stamped sheet-steel wonder where every piece of the weapon is instantly replaceable. Here we are likely to be handling valuable antiques, the parts and pieces of which might not come apart easily and they may not be so easy to replace; that changes the picture. Your best bet would be to take a time out and locate a specialist-gunsmith that is skilled in this kind of work and have him or her perform whatever cleaning, inspection or repairs that you or your customer have in mind. Any fees that may be involved are usually far out-weighed by the potential scope of the permanent damage that a novice might do to a valuable antique firearm, and make no mistake: Even though the degree of harm done may depend on the weapon and the circumstances, there is real potential for irreparable harm to be done.

Read the instructions! If the answer to your little self-examination above was yes, I do feel confident that I can accomplish the work on this old gun successfully, then we may proceed.

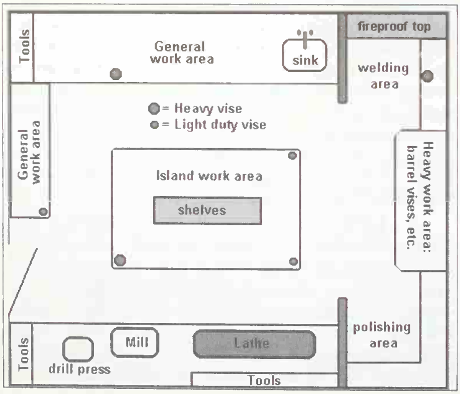
But hold on: Before you turn a screw you should obtain the specific disassembly instructions for the firearm(s) you will be working on. It is always better if you can get the kind that comes with blown-up pictures (exploded diagrams) which show all the parts fanned out in their correct relationship. These illustrated instructions will be particularly useful if you have become used to working with modern weaponry; many of the operating mechanisms used on these 19th century firearms could present you with quite a surprise. Instructions like these can be gotten from several sources (see the chapter on "sources") for production-made weapons, including many of the older ones, although there are a few exceptions. Once you've obtained the correct set of instructions for your gun, study them well to make sure that you fully understand the gun's mechanism, and how all of its component parts fit together and operate.

About your bench and work space: Unless you are opening a full-time gunsmithing operation, you probably won't need a whole lot of room. After all, it isn't as much the size of the space your work will be performed in as its quality, to wit: A quality work space means having an area to work in that is comfortable, clean, and well lit this is an essential component of repairing firearms successfully. The area should be *comfortable*, so that it will be easy for you to make the weapon you are working on your only point of focus; this also means the area should be dedicated to performing this work. *Clean* because you should never have to overcome the sense that you are working in a pig sty while trying to produce quality work. The old adage "the neater work area the neater will be the workmanship" doesn't necessarily mean that you will do poor work if you are in a messy area, but in my experience the neater the work area is kept, the less stressful I find it to work in. *Well lit* for the obvious reason; so the workman (you) will be able to clearly see all the details of the work at hand. Use enough light; but not light of such intensity that the glare distorts the details of the work before your eyes. Flat white or off-white walls and ceilings along with an infusion of low-glare, flourescent lighting or reflected incandescent lamps will make for a well lit area that produces very little eye strain.



This type of bench uses the basic, rugged concept of dimensional lumber that is bolted and screwed together. The plan can be sized to suit your individual requirements and may easily be expanded to make the bench longer, deeper, higher or go around a corner. Author illustration.

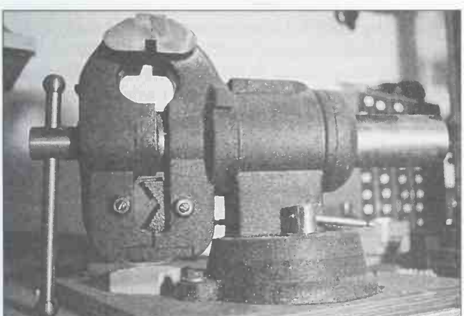
Your dedicated bench-top space doesn't have to be huge either, a person can get by just fine with a cleared work area that is a minimum of about four feet long and two feet deep: this is quite sufficient to handle one weapon at a time. In fact, sometimes a smaller work top is better than a large one; when the work area is kept small, then you are forced to keep it clean and neat in order to have room to work in it. Try to locate your workbench along a wall; while you are at



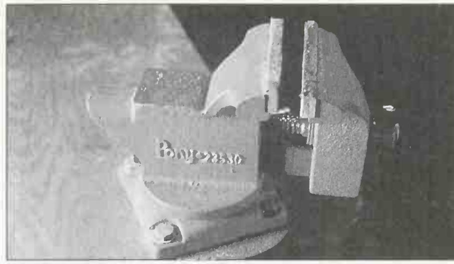
Left: This is the original plan for the author's former shop in Maine. Installation of the center work island left a corridor almost three feet wide to walk around the island, no matter which way you turn there is always a comfortable work bench top right in front of you. Notice the welding and polishing areas are segregated from the main room by walls. Bluing and plating is done in another room. Author illustration.

it, it's not a bad idea to try and place the bench near the center of the wall so there will be room on either end of the bench for longer weapons to overhang. It is also a sound idea to make the extra effort to anchor your workbench into the floor or the wall (or both), of the workshop, so that you will both minimize the bench's movement and to maximize its rigidity. Use steel angle-brackets and small lag bolts or heavy duty wood screws purchased at your local hardware store to securely fasten the angle-brackets into the floor and into wall studs. Illustrated here is one suggestion for a small gunsmith's workbench that works well; you can easily alter the plan once you have decided what size and shape bench you want in your individual work area. This type of bench makes use of the simple and relatively rugged concept of dimensional lumber that has been bolted and screwed together and is one which you can easily expand on to make the bench longer, deeper, higher or even go around a corner if you chose to.

My present workshop layout is housed in a dedicated, square room of medium size. The whole layout was moved almost in total, from my previous shop in another state which was somewhat larger. In an attempt to gain the maximum amount of workbench-top area when this workroom was originally planned, I first elected to place workbenches around most of the perimeter walls. Later I decided on the addition of one oversized, rectangular bench forming a walk-around work island at the center of the work room. At the center of this island workbench we installed hand-built wooden shelving extending from the bench-top to the ceiling, with drawers for tools near the bottom. Adding the shelves at the center of the island left the island with a clear bench-top work area about two feet deep that extended all the way round the island's top. The installation of this center work-island left us with a corridor almost three feet wide as a walking area around the work-island, so no matter which way you turn there will always be a full-sized, comfortable work bench top in front of you.



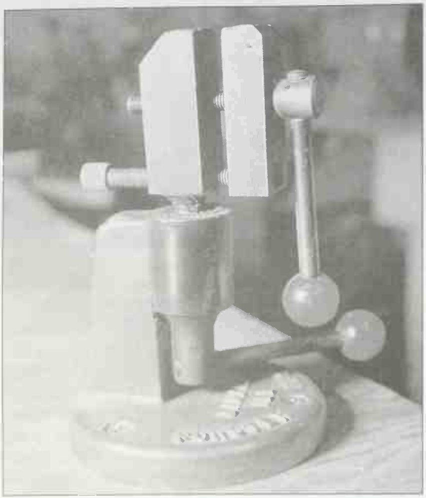
Here is an imported heavy-duty vise with a four-inch capacity that has not only a swiveling base, but the entire vise-head can be rotated 360 degrees. Rugged imported vises like this can be had for between $50 and $100, but for gun work they must have their jaws replaced with jaws made from non-marring? materials. Author photo.



A light-medium duty swivel-based vise doesn't have to cost you a fortune. Here is an inexpensive vise that the author purchased for under $20 at a department store. The only alteration was the addition of shop-made hard maple jaws for gun work. Author photo.

Vises: Vises are a really important part of the workshop; they perform the inhuman task of holding your work fixed and rigid for you, allowing you to work with both your hands. I am including them here instead of in the chapter on tools, because they are a basic component of your workshop and I believe they are important enough to be considered right along with the work benches. Years of working in shops has shown that the placement of the vise is also a very important consideration, and I've noticed one that not everyone pays much attention to. It was only after having my own shop for a few years, that I started to give any thought to where my vises were placed and when I did, I had to admit that all my vises were in poor, inconvenient locations. After giving a lot of thought to where the best locations for vises would be, and trying several would-be "great new locations" out, it seems that mounting the vises at or near the ends of the workbenches offers the workman the largest amount of exposure to the workpiece. So by placing the vise effectively on the corner of the bench, you have left yourself the option of moving all the way around the corner of the bench while you are working on whatever you have secured in the vise.

How many vises should I have and how big should they be? In truth, the working gunsmith should have a couple of vises, at the minimum. One: Your main vise, would be a good, heavy-duty bench vise with a least five inch capacity; another could be a light-to-medium duty bench-type vise with about a three-inch capacity. Both vises ought to be mounted on swiveling bases. To prevent damage to the firearms you will be working on, you definitely will want to make yourself a set of hardwood (straight-grained maple or beech will work very well for this project) jaws to fit each vise. Those toothed iron jaws that come as standard equipment on most vises are really not suitable for any sort of gun work; they would surely ruin the finish, as well as do serious damage to the surface of any firearm. It's easy to make your own hard-wood vise jaws; just unscrew the original iron jaws after you get your vise mounted and simply saw out exact duplicates of the original jaws from hard-wood, drill and counter-bore the holes to accept



This is Forster's tiny, but highly functional vise. While it is definitely light-duty, it's just the ticket for holding a new screw while you cut the slot; as a bonus it's so compact it can be screw-mounted to a small board, and it becomes instantly portable by using C-clamps to hold it in place. Author photo.

the mounting screws and install them on your vise in the place of the originals. Some different options for non-marring vise jaws or jaw facings can include bronze, lead, rubber or cork-rubber, and all of these are available from our friends at Brownells.

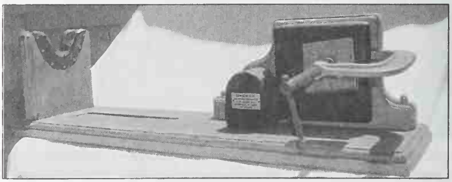
What's the best vise? Honestly, there really is no "best vise" since each size and type is best suited for its intended purpose, but in terms of versatility the Versa-Vise sold by Brownells could be one of the most useful purchases a working gunsmith will make. While not by any means a substitute for the *heavy-duty* vise (you will still have plenty of use for a large, heavy-duty bench vise to take over where this one leaves off), this little number does swivel and turn in ways that most vises will not; my guess is you will find the Versa-Vise suitable for holding about 90% of the work you are called on to perform. If you are working with a limited budget, there isn't a need to spend a lot of cash on your light-to-medium duty vise, swivel-based vises in the three-inch capacity range can be bought for under $20 today and they will serve you well for your light-duty needs.

Smaller yet: Another very handy addition for your bench would be the tiny swiveling vise made by Forster which is just superb for holding screws and small parts. Forster's itty-bitty, yet highly functional vise, is super for holding a newly made screw while you cut the slot. Because it's so small it can also be made portable by mounting it on a six inch-by-six inch piece of 3/4" plywood and fastened to the workbench with two C-clamps when you need it; then when you don't need it any more, the whole thing can be un-clamped and stored out of the way.

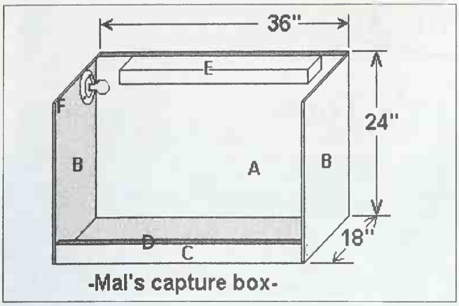
The rifle vise or gun cradle: Speaking of comfort and convenience, a gun cradle can be a wonderful contraption to have in the work shop as an aid in the disassembly and assembly of long arms of all kinds. Sometimes called rifle vises, these contraptions can also be employed for holding the long gun during many types of light-duty gunsmith work such as sight adjustments, telescope mounting, cleaning and the like. The rifle vise is really a kind of a specialized holding device that comes with non-mar padded cut-outs which accept the barrel and the stock, as well as a padded clamp to secure and hold the gun in the cradle by the buttstock. A gun cradle is a lot like having another pair of hands and by now we all know that many times we could use an extra set of those.

Lost parts and the captive disassembly box: Flying springs. . .*oh no!* Have you ever been in the midst of disassembling a firearm and had the misfortune of having a powerful spring jump out from inside of the weapon, catching you totally unawares and getting loose? When this happens, those lithe little leapers have a nasty habit of quickly getting away from you as they take off flying and bounding across the shop, or through the house, somehow always going in exactly the opposite direction you think they did; in many cases, never to be seen again. To make matters even worse, the errant spring probably carried with it several of the attendant parts which surrounded it. This need not happen at all, for we actually can do something to thwart the loss of small parts. We do this first and foremost by simply slowing down and then applying just a little dab of common sense. Refer back to your disassembly instructions like I said earlier; remember, when I suggested getting to know how that weapon works and what it is that's inside of it? If you really have made yourself familiar with that firearm's mechanism, you are already a whole lot less likely to be surprised by a silly little spring.

There is also a very practical and inexpensive disassembly trick that I learned long ago from an old friend;, a German-born auto mechanic working in southern New York state who, among other things, restored old foreign sports cars for a living. He taught me that if I would take the time to place any piece of small machinery (like a firearm) into a captive, controlled environment before I began to take it apart, then all the little pieces and parts will stop getting



Here is the author's dirty and worn rifle-vise (gun cradle); this one was made by Decker in the 1990s and in spite of some awfully hard use is still going fine. Author photo.



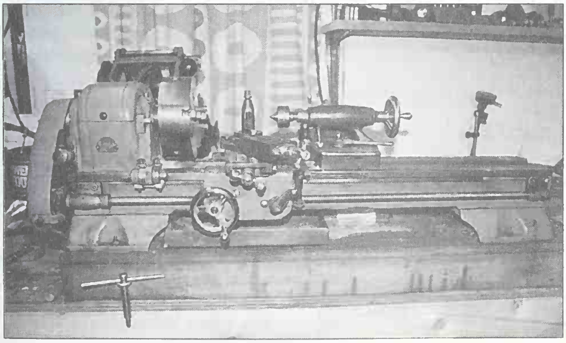
Here is a sample of a capture-box of simple plywood construction with ample room for handgun work; the design may easily be expanded to hold any size firearm. The box uses butt joints which may be glued and fastened with finishing nails. Paint the insides a non-glare off-white color, then add a small light fixture. A: 3/4" plywood back. B: 1/4" plywood sides. C: 3/4" pine front plate. D: 1/4" plywood bottom. E: kitchen counter-top flourescent light fixture. F: porcelain incandescent light fixture. Author illustration.

lost. Right from the very beginning, this simple idea worked so well that I have continued to use it for over thirty years. In honor of him that brought me the idea first, I call this *Mal's Capture Box* and you can make a temporary one in minutes. Get your hands on a large heavy cardboard box, one that is large enough to hold the entire firearm, with enough room left around the weapon for you to work in comfortably (about nine to twelve inches on all sides.) Cut off the box-top flaps and most of one front or back side of the box (leave a "lip" about an inch high at the bottom of the front cut-out) so that what you end up with is a three-sided *miniature work room* sitting atop your bench. You will want to place a good, bright incandescent lamp overhead so that you will be able to really see what's going on inside that box. Now you can place the weapon inside of the capture-box and disassemble it within those confines. Even if a spring or a small part does "get away" from you during disassembly, it will most likely just bounce off one of the inner walls of your disassembly box and end up laying right in front of you; that is, in lieu of it flying off into *la-la land*. And what a great place to disassemble complicated sub-assemblies!

Working inside a box, it sounds a bit silly and maybe it is, but I can assure you that I have used variations of this little trick for years and it has saved me an uncountable number of little flying springs and other tiny things from loss. Ask yourself: How silly would you feel if you had been disassembling a Webley-Fosbery revolver on your bench, a revolver that was worth say, $10,000, and for which there are no spare parts available at any price, when suddenly in the flash of an eye. . .an unknown quantity of those irreplaceable, and surely very complicated small parts, propelled by a powerful spring get loose and take off flying across the room? Using a capture box when disassembling firearms is such an easy step and it can pay big dividends by preventing situations like that from ever happening. I don't believe that I have lost at the most, one or maybe two springs since I began to use the capture box-trick. Honestly, the only screws and springs that have gotten away from me in recent years have happened at times when I thought I was in too much of a rush to bother using the disassembly box. If you are doing this sort of thing for a living, you might want to think about doing what I did in my shop and build yourself a more permanent disassembly capture-box from plywood; while you are at it, paint the inside of the box flat off-white and install some lighting; you won't regret having this very helpful addition in your shop.

Store-bought tools for gunsmithing work: You will need hand tools to work with and since you will be working on good old guns, the tools you will use ought likewise to be of very good quality. What kinds of tools? To name only a bare few, some of these tools may include screwdrivers, hammers, punches, pliers, vises, grinders, drill presses, reamers, torches, lathes, as well as many other items too numerous to mention here and many of these will be of a more specialized nature. Although many of the tools we use for working on firearms have the same or similar names and sound like they are standard tools, I am sorry to have to say that you can't just go to your local hardware store, buy standard *Craftsperson* equipment and expect it to work perfectly for gun repairs. To be fair about it, some store-bought tools will work just fine, some others will work once they have had some alterations performed to them, but while most standard, run-of-the-mill hand tools may look a lot like the tools used for firearms repair, in the end they are for the most part: simply incorrect.

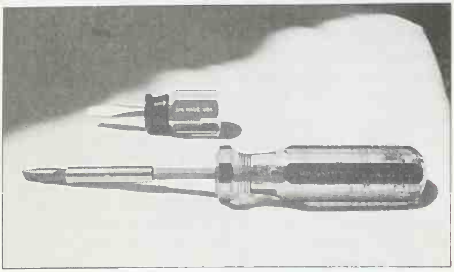
We'll explain more of the differences as we get into the next (tool) chapter and I believe you will get the idea pretty quickly. There are also some wonderful sources for purchasing gunsmithing tools, as well standard tools that can be altered to work as gunsmithing tools listed at the end of the next chapter.



This old 6" Atlas is the ideal size lathe for the majority of gunsmithing work; on it the smith can turn out screws, pins, small parts and tools. Author photo.

Chapter 3

The Gunsmith's Tools



In the foreground is one of the most valuable of all my tools, a well used Brownells Magna-Tip screwdriver. Because of its replaceable hollow-ground bits, the Magna-Tip screwdriver has the capability of fitting a great many different screw-slot sizes. The pretty new screwdriver in the rear will be virtually useless for gun work unless its tip is hollow ground. Author photo.

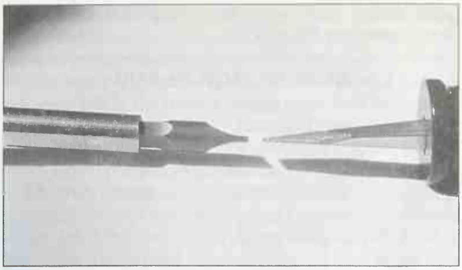
On this very "busy" bench top you can see a variety of the type of firearms this book deals with plus a selection of the special gunsmith tools and products used in their repair. Author photo.

Screwdrivers: the gunsmith's meat and potatoes. As a gunsmith, one of your most basic and important *primary* tools will be the screwdriver. Hold it. . .stop right there, don't even bother fooling around with those cute yellow, blue and red handled screwdrivers, like the kind you can buy at the hardware store. I'll have to admit those sure are pretty tools, but they won't work worth a hoot in gun screws because their driving ends (the blades) are tapered in order to allow it to fit into a wide variety of different generic screw slot sizes, although in truth they will probably never fit into any of them very well. Old-time gun screws and a good many modern gun screws have precision ground slots that are *square-sided*, so what you have got to have are good quality screwdrivers that are manufactured specifically to fit into these kind of screw slots; these are called hollow-ground screwdrivers and they have square sided tips on their blades. After all, you really do not want to ruin these precision-ground and nicely polished screw heads, or even worse yet: You can't have that driver slipping out of the screw slot while it is under a lot of strain where it might flail about and gouge up the finish on the side of some fine old firearm all just because you elected to use a screwdriver that didn't fit correctly in the screw slot.

Dave's Tools of the Trade...

- **Screwdrivers**
- **The screw jack**
- **My own dummies**
- **Files**
- **Hammers**
- **Punches and pins**
- **Pliers**
- **Barrel vises and action wrenches**
- **Drills, taps and dies**
- **Hand grinders**
- **Specialty tools**
- **Tool sources**

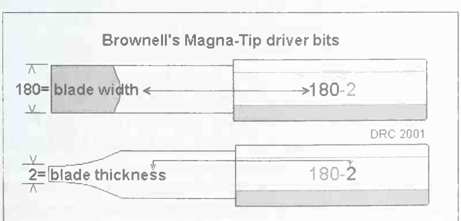
Gun screws also come in many different sizes, so they use proportionately varied width and breadth driver slots. You can see that choosing the correct size of hollow ground driver, one which "exactly fits" the screw you want to loosen is of paramount concern during firearms disassembly and assembly. Fitting exactly means just that: Exactly, not a just little bit too small, or a tad to large so that you have to beat the driver into the screw slot with a hammer. The screw-

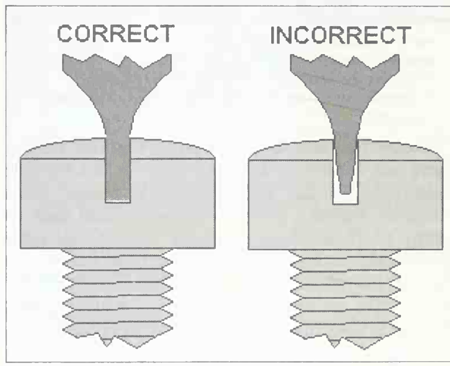


On the left is a gunsmith's hollow-ground screwdriver, at the right a common run-of-the-mill general purpose screwdriver. Both are high quality tools, but only the one on the left is suitable for gun screw slots. Notice the taper in the tip of the general purpose screwdriver bit. Author photo.

driver's bit or blade should slip into the screw slot with just a little resistance and it should bottom out in the screw slot completely. The blade should also fill the entire width of the slot, but still not be so wide that it contacts or scrapes against the surrounding metal on the firearm. It wasn't too many years ago that gunsmiths would have to make up all their screwdrivers on a "custom-made" basis; later they would alter store-bought screwdrivers to suit their needs. Still later, I believe around the late 1940's, the special hollow-ground gun screwdrivers that we are familiar with today became commercially available. The tough thing with old guns is these gun screws come in all sizes and with a great variety of different length and width of screw slots, so that until fairly recently any well equipped gunsmith who had been in business for any length of time, would have over the years, accumulated literally hundreds of different screwdrivers, and every blessed one of them in different custom sizes and shapes; often so many that the screwdrivers alone occupied several drawers of a large tool chest.

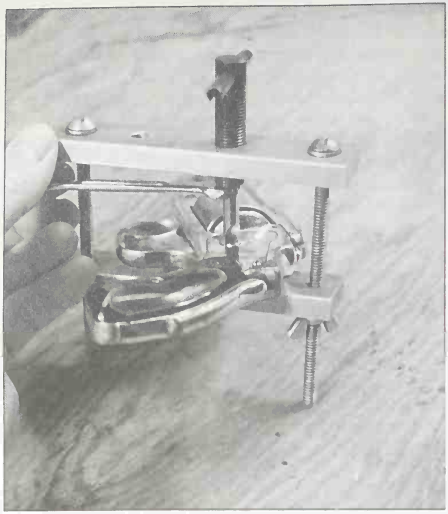
Fortunately for all of us, today there is a much neater and far more accurate and compact alternative to having to deal with all of these different size screwdrivers: It comes in the form of a really unique screwdriver set intended for the professional or the amateur gunsmith and its sold by Brownell's, Inc. under their trade name "Magna-Tip". Here's how it works: The Magna-Tip system is basically one master screwdriver handle assembly (several handle sizes and types are also available), that uses a standard hex drive that allows the one handle to accept about as many sizes of factory-made, quick replaceable, accessory screw driver-bit tips as you could ever imagine. All of the Magna-Tip bits are hollow-ground and specifically sized to fit a large number of the more common, and some not so common gun-screws. Magna-Tip screwdriver bits are tough as nails in my experience; in fact, for the most part they have outlasted any conventional screwdriver I've ever owned. A rig like this is exactly what you want for this kind of work because of the replaceable bits which come in such a wide variety of blade widths and in several blade thicknesses; they allow you to cover almost any screw slot that you might come into contact with. With a large set you can potentially have the capability to drive over a hundred different size screws, all of them along with their handle stored in a space that would be covered by the span of a hand. Screw-driving has indeed come a long way!



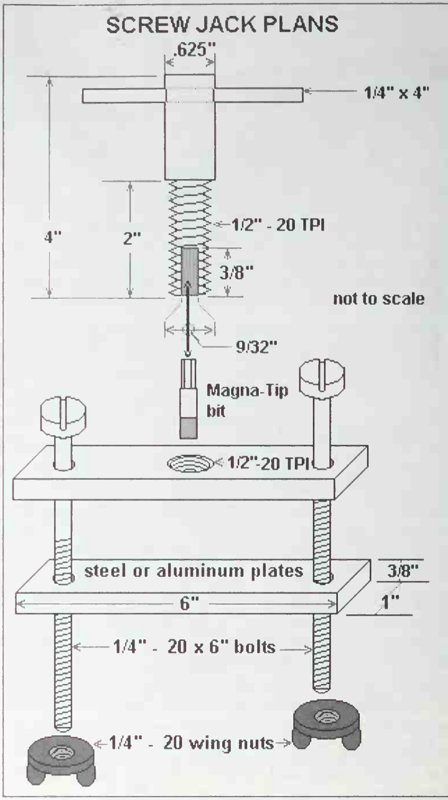


When you have the opportunity to work on any of the hand-made, and truly antique firearms such as a beautiful Kentucky rifle, you will see that to turn their screws a custom ground screw driver bit is absolutely essential; their screws of course are totally hand-made and you will seldom find any two alike. Exactly for screws of that sort, with slots that the stock size hollow ground screwdrivers or Magna-Tip bits won't fit into, Brownell's makes a special Magna-Tip bit grinding stone so you can custom hollow-grind one of their larger size bits to fit the exact requirement of your gun's screw slot. No doubt about it, using the proper screwdrivers can save you hundreds of dollars and hours of wasted time per job, that is most especially true with antique arms and I can't possibly stress their importance too strongly. Put some of your hard earned money into a serious screwdriver set right up front, its a sound investment that you will not regret later.

your having done some removal prep-work on that stuck screw (see Chapter 4.)



The B-Square screw jack can be a very important tool for the removal of tight screws. The jack provides an effective means of holding the driver bit tightly into the screw slot while the bit is turned with a small open-end wrench. Author photo.



The screw jack, a special purpose screw tool: A screw jack is a tool made by B-Square (or that you may make yourself) that may be used to remove some extremely stubborn screws but may only be used on screws which still have a slot that is in at least fairly good condition. This tool can't be used everywhere, and the complicated contours of some weapons may prevent the effective use of the screw jack. Built like a clamp, this tool is comprised of two pieces of heavy aluminum plate (or steel) with machine screws and nuts at either end; one plate is equipped with an adjustable device at its center that will accept a Brownell's Magna-Tip bit. In practice, the screw jack is actually clamped around the firearm with its center, containing the Magna-Tip screwdriver bit over the top of the effected screw, where it is tightened in place. Once the clamp is tight, the adjustment at the bit is tightened just enough to hold the driver bit down firmly in place in the screw's slot. Next a one quarter inch open-ended wrench is used to actually turn the Magna-Tip bit and hopefully, the large amount of torque provided by the wrench, coupled with the fact that the bit is clamped tightly into the screw slot, will either cause the screw to turn or the bit will break. If the bit doesn't break and the screw stays stuck; you might rip the head out of the screw, there is that much potential available. In any case, the screw-jack has so much torque that it will make something happen, so it is not a tool that should be used lightly nor without

Screw jacks should be used only to break the screw loose initially, and once the screw has broken loose the jack is removed, the bit is placed in a screwdriver handle and the screw is removed normally. Once again, whenever you encounter a screw that is really tight and you feel that it might be a good candidate to use a screw jack for its removal, always use the screw removal procedures outlined in the gunsmithing section along with the screw jack, and your chances of a successful screw removal will increase by at least 100%.

More screw tools: The impact driver is another type of screw-loosening tool that works by action of hammer blows to create a rotary impact which will sometimes loosen a tight screw. The only rub here is that you need a perfect, or near perfect slot to start with. And unless you have already become skilled in the use of a tool like this, your chances are better than good that upon impact the bit is going to jump part way up out of the slot, thus ruining it for good along with the high potential of dam-

aging the surrounding metal. For all that trouble, if the above happens the screw will probably still be tightly fixed in place; since the bit jumped out midway, so the impact was never properly applied, and a lot of good it did you! While the impact drivers have their place with newer weapons, I don't recommend these tools with antique guns under any circumstances and especially when new replacement screws are not available.

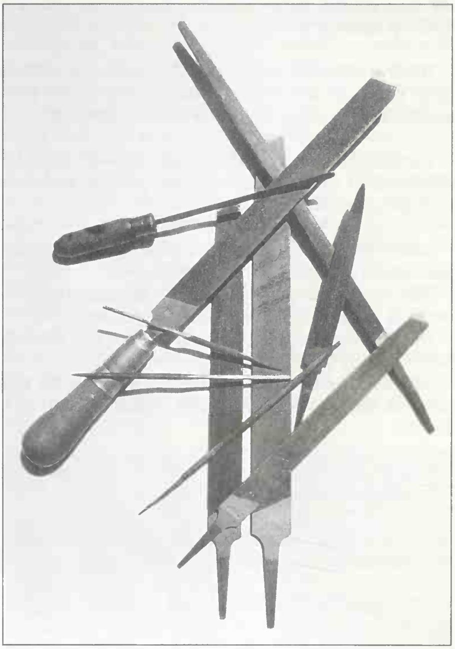
My own dummies: This sounds like we might be trying to talk about ventriloquism and I am about to tell you about my Mortimer Snerd doll. Well, maybe another time. The dummy we want to focus on here is the cartridge or rather non-cartridge kind; the dummy cartridge. If you are serious about guns, whether you are going to do gunsmith work or not, even if you just have guns on display in your home then the dummy cartridge is for you. We all know, or we should know, that live ammunition is never kept anywhere near the guns we keep around the home or shop. This is among the most important of the basic firearms safety rules, we would like to think that good sense would lead everyone to follow them. I wish I could tell you that everyone practices those rules but I cannot.

Dummy cartridges like these come in many calibers and are available from Brownell's. No thinking gun repair person should operate without a full set! Author photo.

Brownells sells very high quality inert rounds, otherwise known as dummy cartridges in many popular calibers for rifle, handgun and shotgun calibers. Every working gunsmith as well as every gun owner who displays his firearms ought to have a good supply on hand. These should be the only cartridges that are ever kept near your firearms unless you are shooting them. For the gunsmith they are the only safe and useful way to use cartridges to determine how a gun is feeding or ejecting, or how a cylinder is indexing as well as other uses around the shop.

Files: Files are another of the indispensable tools for the gunsmith. Files are used for so many jobs that you can't ever have too many. When a milling machine isn't available, a hacksaw and files can do the job most of the time, albeit a whole bunch slower. Here is a quick look at some of the different types of files and suggestions for where and how you might find each a useful tool.

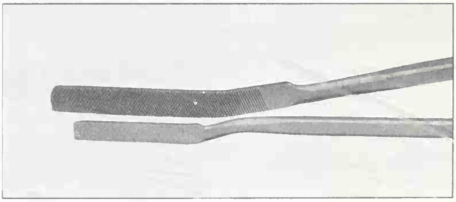
Barrette files: Tapered flat files with safe back and edges intended for detail work.



A selection of files you might find around a gunsmith's shop. Author photo.

Checkering files: Used to cut checkering in metal like that on hammer spurs, back-straps, and etc.

Cylinder stop window: this is a specialty file that has been shaped to allow the gunsmith access to the opening in the frame the cylinder stop (bolt) comes through.



Special purpose gunsmith files for revolver work can be extremely helpful, these come from Brownells and are of high quality. The file in the rear is for hand windows while the one in the foreground is made to work on the cylinder stop window. Author photo.

File cleaner: sometimes called a file card, this essential accessory is as its name implies, used to clean debris from the file teeth.

Half round: A multi purpose file which cuts both on its flat and on the half-rounded back side, most of these are of a general purpose nature, bastard cut and will work on metal or wood.

Hand window: Another special purpose file offered to the gunsmith so he can work on the sides of the opening through the frame where the hand fits through.

Long-angle lathe: a stiff, heavy file with specially slanted teeth intended for use on spinning materials such as those spinning in a lathe.

Mill: a flat, tapered general purpose metal cutting file that cuts on all four sides.

Mill bastard: a rough cutting file, often cut with an irregular pattern to prevent buildup in the teeth.

Mill 2nd cut: Between fine and bastard, this file cuts fast but nearly as smoothly as the fine cut.

Mill fine: As the name implies, a fine cutting file that removes little material and leaves a finer finish than a 2nd cut.

Needle files: Small, fine files in various shapes and cuts intended for small or intricate work.

Screw slot files: These cut only on their edges and are meant to cut or deepen screw slots.

Sight base file: Some folks used to call these "hacksaw files", the ones Brownell's sells are triangular and parallel with only one side cutting. These files are very useful for cutting or re-shaping barrel dovetails

Three-square-bent needle: Small, triangular needle files with their fronts bent up and blind-back edges, only Brownells has these and they are just exactly the right tool for cleaning up checkering.

Triangular: sometimes called a rat-tail, this file cuts on all three sides and is normally sold in bastard, 2nd and fine cuts.

What to hit with. Hammers, yes and you will certainly need hammers. Believe it or not you will probably use hammers at least as often as you will use your screwdrivers. It has now been many years since the service representative from one of the major arms manufacturers came to my gun shop in Maine for the first time. He was there to perform an inspection as a part of the application process for me to become a factory authorized service center for his company. I had spent most of the two days before his arrival frantically cleaning and making the shop as neat as I possibly could, or so I thought. On meeting the rep, whose name was Fred, I must confess to having been quite intimidated. Here I was a kid in my thirties, this man was many years my senior and right off the bat he had made the point of telling me he had been doing his job for more than thirty years and that he already knew *everything he needed to know*. . . Now, I didn't know anything about Fred or that he would turn out to have one of the best senses of humor I would ever encounter. All I knew right then was; there wouldn't be anything I could put over on him. This fear turned to near terror when I looked down and noticed that in spite of all my clean-up efforts, I had left my big hand-sledge hammer laying out on the floor next to the anvil. Now this old four-pounder wasn't exactly what you would call a high precision tool, and it was just about the last tool I wanted to admit to this guy that I owned and kept laying around my "precision" gun repair shop. If he should see this bludgeon well, I guess I figured my shop would fail his inspection.

Lo and behold, this guy Fred had been in my shop for less than a minute when to my bewilderment, the first thing he asked me after picking up the tiny ball-peen hammer on my work bench and giving me a disappointed *"oh, you just failed the test"* glance, was; "Alright son, now I want you to show me where you keep your *real hammers?*" What?! . . .Until he said that, I had still been wondering just how I was going to sneak over to the anvil and hide that nasty little short-barreled sledge hammer from his view; now I was sure my goose was cooked. It was with more than a little bit of apprehension that I sheepishly showed him where I kept my 32- and 48-ounce ball-peen hammers and last but not least, I pointed to that dreaded monster, my four pound hand-sledge. To my great surprise and unimaginable relief, on seeing the sledge his face lit up with an obviously satisfied. . .*Yep, and that was all I really needed ta' see*. . . look as he abruptly broke into a grin. Later after a few good laughs, what that factory service representative explained about hammers was exactly what I already knew but for some reason was afraid to admit; the fact that the hammer is one of the most important tools a gunsmith has, indeed in order to be an accomplished smith, somewhere along the way you will have to have become really adept at the many uses of the hammer. Well, my repair shop passed the factory inspection; Fred and I became good friends and I assure you I have never had an ill thought toward that beastly little sledge hammer since.

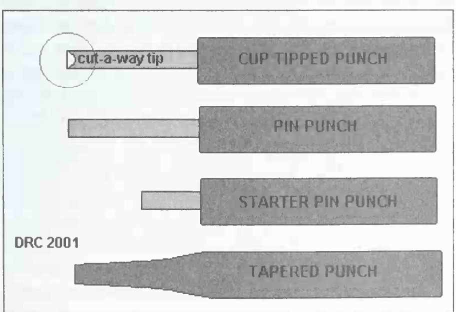
What kind of hammers live on the bench?: For general gunsmith and machine work, the ball-peen style is a very good all-around choice for a general purpose bench hammer and the 4-ounce, 8-ounce (you will find yourself using those two the most) and 16-ounce weights will prove themselves the handiest head weights. Of course, hiding in the corner will be my four-pound-hand sledge. You probably won't need such a heavy *persuader* more than once a year, but it will prove itself a valuable tool when you do. My personal favorite is a heavily worn 4-ounce ball-peen hammer; mine is pretty beat up and on its third new handle in 30 years. A cross-peen hammer is a lot like a ball-peen hammer whose head is on steroids—elongated. Many gunsmiths and

machinists (including the author) prefer this style over the ball-peen for certain delicate, close-in work because for some reason it seems to be easier to aim.

For special work where you have got to use extra care to avoid surface damage to whatever you are going to strike a soft headed hammer is the order. Plastic or nylon headed mallets, and a small wooden or rawhide mallet are all good choices. Brownell's even have one hammer with replaceable heads in four different "soft" materials; plastic, nylon, phenolic or brass. Then there are the so-called dead-blow or no-bounce hammers that a lot of gunsmiths seem to have resisted, probably out of some sort of stubborn passion for the old steel hammers they have grown up with. No-bounce hammers do have a very different "feel" to them that is hard to describe, maybe that's why more gunsmiths don't use them. The truth is, a good dead blow hammer can really help to prevent punches from "jumping" off the pin when they are struck, and friend, it is the only hammer to use for those first few critical blows when you have to drive a badly stuck pin out of the side of a pristine condition factory-engraved Smith & Wesson manufactured in 1871.

With very few exceptions, you never want to strike anything on a firearm with a direct blow from the hammer. In place of the hammer, a punch is held tightly up against the pin or the part that you want to move or remove, and it will be always the punch that is struck with the hammer. There are many different kinds of special punches that are used to force the various kinds of gun pins to move, and to a lesser extent, some other parts that are used on or attached to firearms.

Punches and pins: Almost all guns also make use of cross-pins to hold component parts together, especially where they could use the pin to act as a pivot-point or an axle of some sort. When we remove and install pins we move them in and out by indirect impact, with punches that are driven by hammer blows, and so this moving of pins is called *driving*. For the most part these pins were straight sided not tapered, so they may be driven out in either direction. Some pins are tapered though, and almost all of these kinds of pins would normally be driven out from left to right, (that direction is given with the buttplate to your shoulder, looking down the barrel.) Some newer guns use pins with one slightly enlarged end that has striations (small teeth) in it which are meant to dig into the metal of the firearm as the pin is bottomed out, thus locking the pin in place. Whether the pins are tapered, striated or straight, it can be a safe practice for the gunsmith to learn to habitually drive all pins from left to right, unless of course you are certain from the beginning that the pin is not tapered. In order to drive a gun pin out of a hole from one side to another requires a special kind of punch called a pin-punch. The pin-punch is nothing more than a punch with straight sides and you will regularly use them instead of tapered punches to drive pins out of holes because the straight sided punch won't stick in the hole like a tapered punch would. Pin punches are normally sized from the manufacturer so their diameters are just slightly smaller than the pins which they are intended to drive. For instance, a pin punch that is meant to drive a 1/8" pin would actually be made a few thousandths of an inch smaller in diameter than 1/8" so it will slip all the way through the pin hole without sticking.



These are replaceable tipped gunsmith's pin punches by Brownell's. The shorter of the two is a starter punch. Author photo.

You will find that some gun pins are held very tightly in place either from a too-tight factory fit, or as is more often the case, the result of years of rust or dried up oils. These really tight pins will require yet another type of special punch, called a starter-pin punch that is only to help get the tight pin moving initially. Getting stuck

pins to start moving can be a tricky job if the pin is really stuck tightly because the punch, hence the pin, will have to be hit much harder to make the pin move; this increases the likely hood of slipping off the pin, or of breaking a punch and with it, the chance of scratching or marring the surrounding finish of the gun. The starter pin punch then, is a conventional pin punch that is specially made with an extra-short shank so it will be much less likely to bend or break than a normal length pin punch would be under the harder than normal hammer blows which are often required to break loose a really tight pin. So far, we have talked about straight-sided pin punches of different lengths, and various functions. These kinds of pin punches have been commonly available in solid form, in other words the punch is made from one-piece of steel. Brownell's Inc. also sells many styles of pin punches, including short starter types as replaceable tip-pin punches, these have a two-piece handle/collet with replaceable hardened steel pin tips.

For those few extremely stubborn pins, a *tapered starter punch* becomes the tool of choice. As the name implies, these punches are tapered not straight-sided and somewhat stubby to give them much more rigidity than a conventional pin punch. Because of their tapered shape they are only useful to get a stubborn pin moving initially, after that a starter-pin punch or a conventional pin punch would be used to finish driving the pin. Tapered starter punches come in several sizes. In practice you want select a punch that has a head that is slightly smaller than the head of the pin you wanted to drive so that as the pin begins to move, the head of the starter punch will fit down into the pin hole just slightly but without damaging either the hole, or the surrounding metal.

Surely you will have noticed by now that many of the pins in these older guns which have exposed heads are rounded on their ends. In the trade, gun manufacturers and gunsmiths call this a *domed* head; you will also note that most older gun screws have a similar domed shape. To safely and correctly remove these domed headed pins, we truly should be using *cupped* or *cup-tipped* punches that are made to perfectly fit their corresponding sizes of domed pin heads. If a conventional flat-tipped pin punch were used to remove the domed pins, the flat tip would obviously flatten out and ruin those nice rounded domes, and this would defeat our purpose by detracting from the overall appearance of the weapon. That last statement is especially true with very tight fitting domed pins where it would be very easy to flatten, and slightly mushroom the pin head if you were using a flat pin punch, making the pin even harder to drive. Also, once the domed pin head has beaten into a mushroom shape, as it is driven it will enlarge and then tear up the edges of the pin hole more as it begins to move, thus it is imperative that you make every effort to keep the shape of the pin head intact as it is being driven. *Cup-tipped* specialty punches to suit this need are also available from Brownell's, Inc. They are a bit expensive, for punches, but they are a very worthwhile investment. In fact, I would consider a set of these punches a mandatory part of your disassembly-assembly kit if you are going to be working on 19th century firearms, or in any instance ever have to remove or install a domed headed pin.

Assembly and other specialized punches: Starting a small pin back into its hole during reassembly is another difficult chore that can sometimes be made much easier by the use of another specialized punch that is known as a *magnetic starter punch.* These kinds of starter punches are actually *hollow* punches that have been magnetized, the blind hole at the front-center of the punch is made just deep enough to hold enough of the pin so that it remains straight and stable while you are starting the pin in the hole and to allow you to "set" the pin into the hole slightly deeper by giving the punch a couple of light taps with a small hammer. The pin would then be finish driven all the way into the hole by using the cup-tipped pin punch if the pin is domed, or a flat-tipped pin punch if it is not.

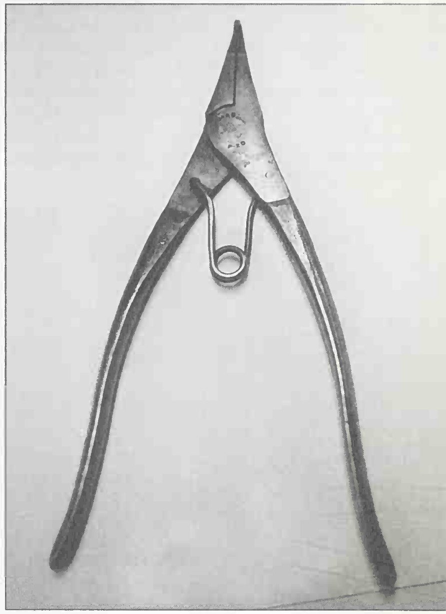
When installing sub-assemblies into the firearm that have one or more separate parts or springs attached with them, the gunsmith will sometimes have to use a special kind of assembly pin that is known as a "dummy" or "slave" pin. A slave or dummy pin is made so that it is shorter than the normal cross pin so it doesn't extend all the way through the gun; its only function is to hold all the small parts of the sub-assembly captive and in order, while the sub-assembly is being held in alignment with the pin holes in the gun for assembly. The cross pin is then driven through the holes and as it passes through the sub-assembly, the cross pin replaces the slave pin as it in turn drives it out the other side of the hole. As the illustration shows, the slave pin is a piece of pin stock (drill rod, for the most part, these are gunsmith-made to suit special requirements) that has been cut off to the exact length required so that it will hold only the sub-assembly together, but it is not so long that it will interfere with installation of the sub-assembly fitting into the area of the gun where it belongs.

Punches that aren't used to hit pins? Stippling is a method of roughing up a metal surface to provide a better grip, what some call a non-slip grip. You won't see much of this on antique arms but the technique has become popular on some of the more modern .45 Auto based race-guns. This is accomplished by holding a special punch, called a stippling punch against the metal and hitting the punch with a hammer. Stippling punches have sharp angled tips which dig deeply into the metal and also raise up sharp burrs around the dent produced by the tip. So-called alignment pins or alignment punches are yet another specialized item which, although they at first appear to be long, mildly tapered punches, they are in reality not used as punches. Alignment punches are tools that are meant to be used when one or more loose parts that are intended to be held by the same screw or pin within a hole need to be aligned before the fastener (pin or screw) can be inserted. Pins

are not the only parts on a firearm that get "driven" or moved by using a hammer and punch. When you have the need to drive sights in and out of a dovetail in a gun barrel, this is a job that requires a punch which won't mar or damage the ends of the sights while they are being driven. Special purpose punches for this somewhat delicate sight work are available in brass, aluminum and plastic, they are the so-called *soft* punches which are intended for just this purpose and they come in round, square and rectangular shapes.

Punches like the ones here are made for moving sights and other accessories found on firearms. Brownells sells these with brass, aluminum or plastic replaceable heads. Author photo.

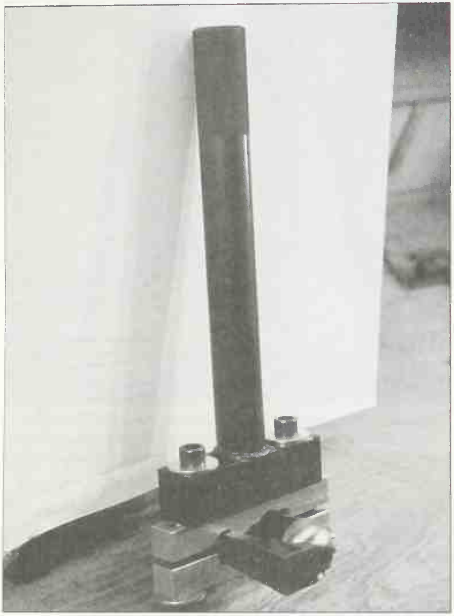
Pliers: Gunsmiths use pliers . . ? You bet they use pliers, and you will find many variations of the different types of these useful grasping tools in most gunsmith's tool kits. In addition to the typical needle nosed, diagonal cutting and conventional slip-joint types of pliers that we will want to have in our general purpose gunsmithing tool kit, a very valuable addition can be a set of what are sometimes called "spreader-pliers". *Spreader-pliers,* which are also known as *horseshoe-ring pliers* or *lock-ring pliers* perform in exactly the manner which their name implies they might; instead of grasping with a crushing movement like a normal pliers, spreader pliers move in the opposite direction so they are meant to open things up, to expand and to spread things apart and they grasp whilst opening. In the automotive trades these types of pliers are regularly used for spreading apart the different kinds of circular shaped lock-rings, horseshoe lock-rings, and spring lock-rings. In the context of performing gunsmith work on older guns, we will make use of these very handy backwards operating pliers during disassembly and assembly where they may become our invaluable assistants when the need arises to compress the oddly shaped and complex leaf mainsprings and sometimes trigger or sear springs that were used in more than a few of these Victorian era firearms. Vise-grip pliers are also in use on the smith's bench, particularly special purpose types which are made to be used as crimping tools.



Spreader-type pliers like these are sometimes called horseshoe-ring pliers, they are terrific for compressing the mainsprings in old guns during assembly and disassembly. Author photo.

Barrel vises and action wrenches: Sometimes fire arms that use screwed-in barrels will require repairs which mandate that the barrel be removed from the receiver. Gun barrels can be screwed in very tightly from the factory and added to the original tightness may well be one hundred year old dried up lubricants and rust within the barrel threads. In short, old gun barrels can be very difficult to remove and in most cases it does take special equipment to accomplish this without doing damage to the firearm. This brings us to barrel vises and action wrenches, which are the tools that are used to hold the barrel and action securely and safely, offering sufficient purchase so the receiver may be unscrewed from the barrel. These tools can be somewhat expensive so if you think you will be doing this work only occasionally, you might consider farming it out to a fully equipped gunsmith shop. The professional gunsmith should consider owning these special purpose tools if he or she intends to do work that will involve barrel removal and replacement on a regular basis; even when that is to be confined to the somewhat mundane task of *setting-back* revolver barrels in order to correct excess barrel-to-cylinder gaps.

The barrel vise is meant to be bolted securely to a heavy-duty work bench; its internal jaws are round and are made so they will accept round split-bushings of various diameters and tapers which are in turn made to match the outside contours of common gun barrels. It's a heavy duty affair that is meant to clamp extremely tightly around the circumference of round barrel eliminating any chance of slippage. Many gunsmiths take this even further by applying powdered rosin to the inside of the vise bushings to increase clamping friction.



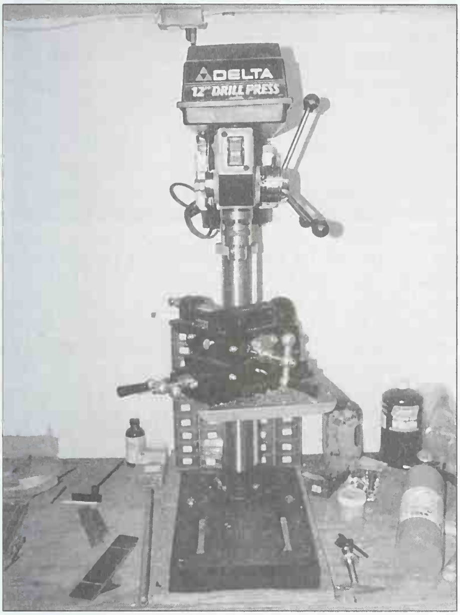
Action wrenches are used to unscrew the frame from the barrel, and the good ones are designed to perform this operation without harming the frame. This excellent action wrench from Brownell's offers removable heads that are shaped to match the frame contours of various revolvers like the Colt SAA shown. Author photo.

The action wrench is a simple, heavy-duty split-headed, clamp type wrench equipped with a long handle that is supposed to clamp tightly around the ring or front part of the receiver, allowing it to be unscrewed from the barrel without damage. In years past an awful lot of revolver barrels have been changed by using a hickory hammer handle as an action wrench. After the barrel had been clamped in a barrel vise, the hammer handle (or a long, squared block of hardwood) was slipped through the cylinder opening and simply used as a lever to unscrew the frame. The hammer handle rig is an old and inexpensive tool that will work just fine about half of the time; it might work fairly well about another 35% of the time, the trouble is it may also cause you to ruin as many as 15% of the receivers you are trying to remove. What happens is that the frames end up twisting or contorting around the receiver ring area (the threads for the barrel are inside the receiver ring) because that area was left unsupported, and once a frame has been twisted, most of the time there is absolutely no way to successfully twist them back. Potentially, the damage you could do to a rare and expensive old firearm just by not using the proper tool to remove the barrel is drastic. Thankfully, today you can purchase special inserts that are made to fit into the head of a certain action wrench. These inserts are shaped to fit the complicated contours of specific receivers quite precisely and by using these inserts you can virtually eliminate the chance of destroying, or even scratching a receiver.

Drills, and drill presses. The drill is an absolute necessity for gun work, there are just innumerable occasions when the gunsmith will have to drill holes. A small shop or casual tinkerer can get by using a variable speed hand-drill or even a hand-cranked breast drill (not to degrade these old hand-crankers, a skilled person can do some awfully accurate work with one of these, and they are much faster to operate than most people today would believe) however, if you are thinking of doing any serious work I would advise investing in a drill press. Any holes you might want to drill in a firearm, whether it be a new hole or drilling out an old screw; it will require great precision. Only with a drill press can the workpiece be locked solidly to the table and the hole precisely drilled in the desired direction, and to the desired depth. Buying a new drill press used to mean spending a fair chunk of change but not anymore; these days a pretty nice little bench-top drill press can be bought for under $200. Most gun work won't require a great big drill press, the medium bench top size will do just fine for the vast majority of this work. Make sure the drill has a 0"- 1/2" capacity chuck, the inexpensive chucks that range from 1/16" to 1/2" will not hold many of the smaller drill bits used for firearms work, so you would end up having to buy a "zero" chuck anyway. Do try to buy a drill press that has a table which is rigidly lock-able. As to its size, a larger table will serve you better than a smaller one.

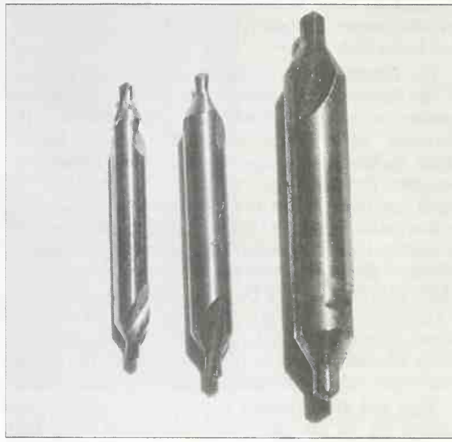
Drill press vises: Here is one spot where I can in good conscience advise the gunsmith to spend some money and be sure to buy a good product. Holding the work rigidly during the drilling is ever-so-critical, and it is here that a high quality holding fixture (vise) coupled with a sharp drill bit can make even a mediocre quality drill press produce great work. Brownell's and other companies sell excellent vises such as the Palmgren which are fixed, and rigidly mounted. Angle drill press vises offer a small measure of workpiece adjustment and cross-slide type vises have their own separate sliding tables with which you may move the work around under the drill bit within a substantial area. Cross slide

type vises of necessity are more complicated than either of the former and with accuracy as your only goal, it is important to chose one of high quality such as the Palmgren CV30 as sold by MSC Industrial, a very reasonable priced (under $100) tool of good quality. Many drill press and milling vises of all types are available in today's market that can be purchased for bargain basement prices, just keep in mind that in most, if not all of those cases, you are going to get exactly in proportion to what you give.



This inexpensive bench-top mounted drill press is the perfect size for amateurs and most small gunsmith shops. Drill presses in this size range will fit almost anywhere, even where there are low ceilings like this shop has. Notice the small fire extinguisher in the lower right of the photo, all shops should have at least one of these in a conspicuous location. Author photo.

Starting screw holes, don't be without a center drill. The center drill is a short, squat looking drill bit made with a larger than normal body. The cutting portion of these drills is very short, and usually much smaller than the body diameter, making for a wonderfully rigid drill but one that will only drill a very shallow hole. That rigidity is why we are even mentioning this as a gunsmith's tool, the center drill is about the best thing you can use to accurately "start" the very beginnings of your new screw hole or for "dimpling" the exact center of a broken screw, prior to drilling it out. The center drill is the first drill bit you will use after you have marked your exact hole center with a center-punch and immediately before drilling the hole with the proper sized bit. Center drills can be purchased from Brownell's, MSC Industrial or any good industrial or tool supplier.



The center drill is short and stiff, it's the best way to begin drilling a hole. Three different sizes of center drills are shown here, usually the smallest are the most useful in gun work. Author photo.

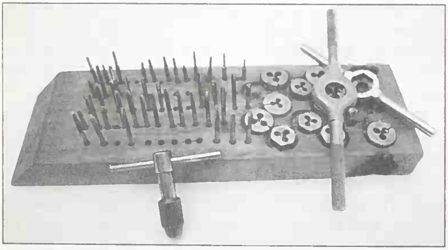
Drill bits: When a person is only doing a limited amount of gun work, it might not ever be worthwhile to purchase whole sets of drill bits that a working shop needs. For this purpose specific, individual drill bits can be bought to suit the situation at hand. The working shop however needs to consider the time that would be required to go out and buy each drill bit that was required for each individual job, and for that reason would want to have a good selection on hand at all times. Jobbers length drill bits are what all hardware stores sell, they are the commonly available drill length. Short length drill bits that are made for screw machine use are far shorter than the jobbers length bits so they are much more rigid and are more likely to drill a straight hole; they are also less likely to bend and snap off during tough drilling. For those reasons and since the vast majority of holes you will have to drill will be shallow, the short length drill bit makes the best choice for all-around firearms drilling. The gunsmith's drill selection should include at least a set from 1/16" to 1/2" and a 1-60 numbered wire gauge set.

Hand grinders: When I was first starting out in the gunsmithing trade I never thought much about these tools, I didn't believe that I would ever need or want one but after only a short time my opinion changed drastically. These small, hand held grinders like the Dremel tool or the Foredom Model CC have proven to be among the most useful tools you can have when you are working on firearms. From the slotting of new screws to routing-out the tight corners inside a rifle stock to grinding excess metal off a hammer after welding; the uses

for a tool like this are unnumerable and in every case, time-saving. All sorts of tools can be had that fit into their tiny chucks, from felt polishing wheels in every conceivable shape to carbide cutting burrs, router bits, grinding stones, carbide cut-off wheels; and you can drill holes with them.

The Dremel tool, which sells for about half the cost of the Foredom tool would seem the best buy for the amateur or part time gunsmith. On the other hand the Foredom, while expensive compared to the Dremel offers the benefit of a separate cable-driven hand-piece; you don't feel the motor's vibrations in your hand so its much less tiring to the user; the Foredom's hand-piece is also smaller than the Dremel, easier to hang onto. As to quality, I understand that Dremel has improved quite a bit over the years so they last longer than they used to. I have not bought a new Dremel Tool in five years or so but in the 15 years before that I went through at least a dozen, in comparison; I purchased my first Foredom about 17 years ago from Bob Brownell on his recommendation and it is still going great.

Taps and dies: Tapping is the process where screw threads are cut into the inside of a drilled hole. Taps are hardened steel tools that look like machine screws with a small-square drive on the top end and with vertical flutes machined into their threads. They are used to cut new threads on the inside of a hole. The tap is held and turned by its square shank in a device called a tap-wrench. Three types of taps will commonly be encountered. The "taper" tap has a long tapered portion in the thread area that makes the tap easy to get started. Taper taps are not much use to the gunsmith except where the hole is deep enough to permit its use, as in the case of a through-hole. Secondly there are "plug" taps, these have a shorter taper in the threads, making them fairly easy to start but useful for the gunsmith because a substantial thread may be started in a much shallower hole than is possible with the taper tap. Then finally there is the "bottoming" tap whose threaded area has no taper and can be used to cut a fully formed thread all the way to the bottom of a hole. Normally a plug tap is used to start such a thread, the hole would then be finish tapped with a bottoming tap.



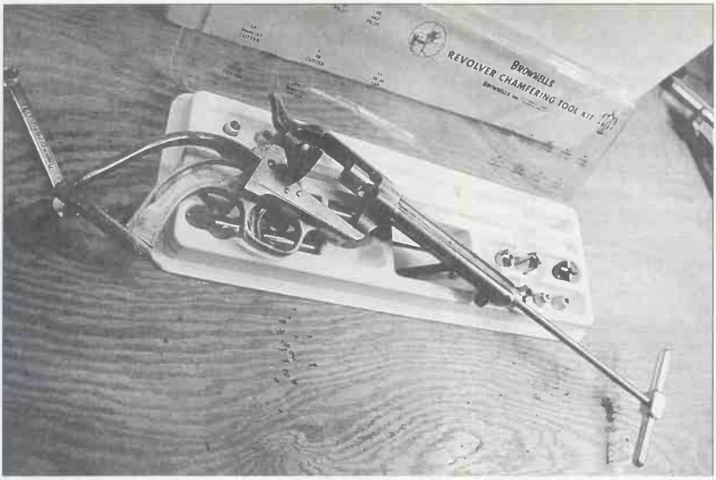
An assortment of the sorts of small taps and dies, shown with dies stocks and a tap wrench found in a smith's shop. The working gunsmith will quickly accumulate hundreds of taps and dies. Author photo.

Dies are circular (or hexagonal) hardened tools which have a threaded hole at their center. The die is often adjustable to a small degree for diameter. The die is held in a special tool; a kind of a wrench called a die stock where it is used to cut the external threads onto a rounded surface, like the threads on the outside of a bolt or a machine screw.

Most of the older factory-build guns made in the 19th century used screw threads that were machined or cut to their own factory's standard; usually that standard was not in conformity with any other industry standard, or for that matter, that of any other company. All that was changed during the 20th century and by the 1950s just about all the gun companies had come into conformity with the new American S. A. E. (Society of Automotive Engineers) standard. Most of the S. A. E. standard sizes available today had their origins in the outmoded screw-gauge sizes developed by American industry during the 19th century; As a consequence most old factory gun screws are quite close to modern standard screw sizes, normally varying only a few thousandths in diameter. When you have to make new screws, very often a modern die size can be adjusted to cut the correct thread diameter, pitch and type for a screw to fit a 1880s factory firearm. Tapping holes may be a different story since taps are not adjustable and the gunsmith simply has to make do by trying to find a standard that will come very close or by resorting to specialty taps (termed special size) in obsolete screw sizes such as are available from MSC Industrial. When you have to tap a ruined hole and there is a new standard screw size that is larger by only a few thousandths of an inch, the prudent action would be to tap that hole for the new standard size, and then make a new screw to match it. Both taps and dies are available in the more commonly used modern gun screw sizes from Brownell's.

A starter kit: To get you started a minimal tap and die set should include the following sizes: 3-48, 4-40, 5-40, 5-44, 6-32, 6-40, 6-48, 8-32, 8-36, 8-40. (Note: The 6-48 and 8-40 sizes are modern gun industry standards and commonly fasten sights, scopes and a myriad of other parts.) Ready-made tap and die kits available from the Brownell's catalog are a good place to start since they supply you with everything required to start threading at very reasonable prices. A fine lubricant for general purpose machine work such as threading and tapping is called Tap-Magic and its available from Brownells, MSC Industrial and other tool supply houses. For tapping harder steel in shallow holes, one of the best lubricants I've ever found is STP Oil Treatment. You simply dip the tip of the tap in the STP and start tapping, but be careful, this is such an effective lubricant that the tap will tend to cut fast and easy; you will want to go slow in any case.

Using the tap & die: The size of the drilled hole you are going to tap should match the minor diameter of the screw thread specifications for this size screw. A tap is never simply screwed into the hole like a bolt. If you



Well thought out revolver chamfering tools by Brownells use a piloted handle to turn a facing cutter which trims the rear of the barrel, and/or internal chamfering cutters that cut forcing cones. Author photo.

tried to do this one of two things would happen, either the tap would act like a drill and simply ream the hole oversized, without ever cutting a thread (this can happen when tapping very soft steels or cast iron), or the tap will start cutting and quickly bind. Since taps are of necessity very hard and tend toward brittle, the tap when bound up, could easily break off; leaving you with this broken piece of extremely hard steel in the hole that you now have to figure out how to remove. If you have never tapped a hole before, you might want to try drilling a few appropriately sized holes into a piece of scrap steel and get your beginner's tapping practice in this, just to give you the feel of things before you attempt the procedure on the actual firearm.

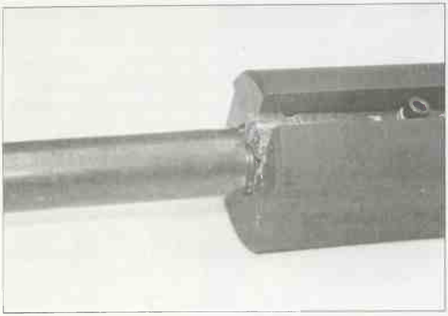
The lubricated tap is started into the hole by first making certain it is entering straight and in as perfect alignment with the hole as you can make it. Hold down on the tap wrench and begin to turn it clockwise until you feel the tap begin to cut (you will feel a noticeable difference in resistence when it begins to cut a thread.) Stop . . . back off the tap and clean the tip and remove any debris from the hole. Lube the tap and start again, this time turning the tap gently until the point of resistence is reached, then push down and turn the tap one half to two thirds of a turn. Stop . . .back the tap's tip and the hole, lube the tap. Repeat that exact operation over and over until the hole is tapped and you will seldom, if ever break a tap. When you near the bottom of the hole (if the hole is blind) use caution and be aware of drastic changes in resistence as you turn the tap. As the tap hits bottom, the resistence increases and it is time to stop, your tapped hole is finished.

The threading die is used in much the same manner as above, however since the threads are external they are easier to keep clean. Nevertheless, the exact same technique that was used with tapping is always recommended; cut one-half to two-thirds of a thread and back-off, clean, lubricate . . . repeat. The outside diameter of the screw stock you are about to thread should match the major diameter of the screw thread specifications for this screw. Your die will have to be pre-adjusted (yes, by you), to do this use an original screw of the same type as a gauge by loosening the die and threading the screw into it. The die is then adjusted smaller just until it reaches the point where when the screw is turned with two fingers you feel a slight resistence.

Specialty tools: These are tools designed to perform a specific operation, most often on a certain type of firearm. We will cover just a few here that are of a more generalized nature but which have applications to antique and modern firearms. Some specialty tools can save both time and money and the following are good examples. If a revolver barrel had to be "set-back" that is, to have its shoulder trimmed so it could be threaded farther into the receiver, we would normally think of having to do this job in a lathe. A lathe is an expensive bit of equipment, especially for the small shop or the gunsmith who only does this kind of work on an occasional basis. Brownell's sells a tool called a Barrel Set-back Fixture. An adjustable carbide-tipped cutter is attached to the body of the tool and is designed so that when properly adjusted, as the tool body is rotated by hand the cutter slowly and evenly trims metal off the rear of the barrel's shoulder. The tool comes with special pilots to fit the various revolver bore sizes, the pilot also acting as a guide for the body of the tool, holding it in-line with the bore. For much less than the cost of a lathe, this barrel set-back fixture works slower than a lathe but is nonetheless capable of producing very good results.

Not having a lathe need not preclude the small shop from other barrel related operations that formerly were the special job of the machine tool. Once a barrel's shoul-

der has been properly trimmed and the barrel re-installed, there is still the thread tenon to be addressed. By moving the barrel's shoulder forward, we have made the threaded portion of the barrel (the thread tenon) longer so now the rear of the barrel will be too close to the cylinder once that barrel is re-installed on the receiver. This would normally be a job that we would either perform in the lathe, or spend the time to do it the hard way with files, doing our level best to keep the cut square during this tedious operation. But now there is another way.



Brownell's barrel set-back fixture is just the ticket for the small shop or gunsmith who doesn't have access to a large lathe for turning barrel shoulders. The barrel is slid onto a pilot on the fixture which is a close fit with the bore, as the barrel is rotated by hand the carbide bit in the fixture slowly cuts metal from the barrel's shoulder. Author photo.

The innovative, inexpensive and modern answer for this also comes to us from Brownell's who have several variations of their "Revolver Chamfering Tools & Kits" available for the gunsmith. The tool is basically a long steel rod with a tee-handle on one end, the other end is threaded allowing it to accept very sharp 90-degree (and lesser angled) cutters. In use, if we were going to trim the rear thread tenon, the rod comes with bore-sized pilot bushings which are slipped on before the rod is inserted into the bore from the muzzle. The pilot bushings hold the rod on bore-center while a 90-degree facing cutter is threaded onto the rear of the rod, which is sticking through into the frame's cylinder opening. As the rod's tee-handle is turned clockwise, and pressure is applied on the tool by pulling toward the muzzle; the sharp facing cutter slowly trims steel off the rear face of the barrel tenon. Once the desired thread tenon length is reached, other cutters may used to replace the facing cutter which will do a beautiful job of cutting a new forcing cone at the rear of the bore in 5-, 11- or 18-degree angles.

Muzzle chamfering too? As if the above tool wasn't handy enough, the folks at Brownell's have taken this idea to new heights by supplying a variant of the above tool, only this is designed to cut barrel muzzles squarely. The tool is known as the "Rifle/Handgun Muzzle & Cylinder Facing & Chamfering Tool". This particular tool isn't just an important addition for the small gun-shop with no lathe; many well equipped and experienced gunsmiths have long desired a method of trimming muzzles that did not involve having to remove the barrel from the receiver first. In fact, years before this well thought out little tool became available I hand made similar muzzle trimming tools for my shop as I am sure other gunsmiths did simply to save time. To center the tool perfectly in the barrel's muzzle using both 90- and 45-degree facing cutters. A separate radius cutter is available to form the outside muzzle radius. To be certain the tool stays stable during the trimming operation, precision ground steel pilots are available from Brownell's in calibers from .22 RF up to .45/70.

This is a 90-degree facing cutter mounted on the piloted Brownell's chamfer cutter tool handle being used to remove metal from the rear of an old Colt Single Action barrel. Author photo.

Specialty revolver barrel taps and dies can also be had from Brownell's and these can be especially valuable for the person who does a lot of re-barreling or barrel set-back work. Sometimes we will encounter a barrel with damaged threads that have to be repaired before the barrel can be installed to avoid damaging the receiver threads. Very often when a revolver barrel's shoulder has been turned back, the threads on the barrel may need to be extended back also, into the area just exposed by trimming the barrel shoulder. For both these instances I can affirm that it is a real time saver to have an adjustable die with which to quickly chase

and repair the barrel threads. It saves us the long procedure of having to chuck the barrel in the lathe between centers and lathe cut the threads; and for those with no lathe, the special-sized die may be their only solution. Likewise, the specialty taps for revolver receivers are the perfect tools for cleaning up those internal threads that may have been damaged during barrel removal or from a previous re-barreling.

After fitting the range rod with the correctly sized pilot for the caliber of the revolver to be gauged it is dropped down the barrel to gauge whether the cylinder chambers are in perfect alignment with the bore. Author photo.

Tool sources: Get yourself a copy of the Brownell's catalog. If you are setting out to do some serious gun work, you absolutely *need* one of these catalogs. All you have to do to get one is to send Brownell's a copy of your current FFL with your catalog request. Brownell's, Inc. is a family owned, all-American company that works out of a small town in rural Iowa. This company started out as a one man show, selling blueing salts to gunsmiths by mail-order in the 1940s and today it has become far and away the world's largest and best equipped gunsmith tool and supply house. Whether you are a gunsmith or a serious tinkerer, you will never find a better source book than this, it contains everything you could ever imagine needing, plus a whole bunch that I'll bet you haven't even thought about imagining yet.

The best part of Brownell's is you will be hard put to find nicer folks to do business with. The late Bob Brownell, founder of the company was a long time friend of our family and years ago I remember telling his son Frank that I always got the same warm, friendly feeling from shopping with Brownell's that we used to get when we would visit the old L. L. Bean store in Freeport, Maine. Even today just like that friendly Bean's store of yesteryear, these honest folks are happy to stand right behind everything in the catalog. They have a huge array of gunsmithing supplies and tools for repair and customizing primarily, but their newest catalog now includes a large line of new gun parts, it weighs in at over three pounds, has 450 odd pages with some 29,000 plus items for sale the last time I looked. Brownell's also maintain a highly trained, and it seems always growing, technical staff that is headed up by Reid Coffield, himself a former long time North Carolinian and master-gunsmith, who you may call during business hours with questions about anything they sell, with general gunsmithing questions; or even to check on the status of the latest crop of ultra-rare, genuine Iowa *frog's fur.*

Large size taps and dies like these by Brownell's are used to re-thread or to cut new threads on revolver barrels and frames. Author photo.

Another source for tools and supplies relating to gunsmithing that you will find very useful is an industrial supply, sometimes referred to as a mill-supply house. Among the best of these is a company called MSC Industrial Supply Co. MSC maintains a massive 4480 page catalog of everything and anything you could ever imagine relating to hand and machine tools and shop supplies, including metals like drill rod rounds. Their catalog index alone takes up 138 pages! In the author's experience this New York based company delivers the goods with fast service, quality products, an amazing variety of 450,000 items and very courteous sales people who, similar to Brownell's, are actually back-up by a knowledgeable technical staff.

A tool kit to build on ...

Fixed and small bench tools
Bench vises: 3" jaw, and 5-6" jaw
B-Square screw jack
Dental tools
Drill bits, short: fractional, letter & number
Gunsmith's bench block
Gunsmith tap and die kit
Hacksaw
Machinist's tool chest
Model makers razor saw
Muzzle & barrel facing & chamfering tools
Pin vise set
Jeweler's saw
V-block set and clamp

Files
Checkering rifflers
Cylinder stop window
File cleaner
Half round: bastard and 2nd cut
Hand window
Long angle lathe
Mill bastard: 8" & 12"
Mill 2nd cut: 8" & 12"
Mill fine: 8" & 12"
Needle file set
Screw slot files
Sight base file: 60 degree
Three square bent needle files: 60 & 90-degree

Hammers
Ball-peen: 4-, 8- and 16-ounce
Cross-peen: 4- and 8-ounce
Hand sledge: 2-4 pound head
Lead hammer: 16-ounce
No-bounce: 1 pound
Soft head, brass: 1"
Soft head, nylon: 1"

Large or special bench tools
Action wrench with frame inserts
Barrel set-back fixture
Barrel vise with bushings

Measuring
0-6" dial caliper
0-6" stainless flexible ruler
0-12" stainless flexible ruler
Bench level, small
Machinist square, small
Thread pitch gauge

Pliers
Chain nose plier, long
Coiling plier
Cutting plier, diagonal 6"
Needle nosed plier, small
Parallel jaw plier, smooth
Slip joint plier: 6" and 8"
Spreader (horseshoe) plier

Power tools
Bench grinder
Disc/belt sander: small
Drill press
Drill press vise
Foredom or Dremel hand grinder
Milling machine: or mill/drill, bench-top
Milling vise for above
Polisher
Polishing wheels
Small (4"-6" swing) bench lathe
Larger (10"-12") machine lathe (rifle work)

Punches
Alignment punches
Automatic center punch
Brass drift punches, 1/4" and 3/8"
Cup tip punches
Nylon drift punches
Prick-center punch
Starrett pin punch set
Replaceable tip punches
Replaceable tip starter punches
Starting punch set

Screwdrivers
Brownell's Magna-Tip super set
Brownell's Magna-Tip thin bit set
Brownell's Magna-Tip bit shaping stone
Chapman midget offset ratchet
Instrument screwdrivers
Screw holder gizzie
Stock take-down set

Miscellaneous supplies
12" surface plate
Assorted hard Arkansas stones
Assorted flat rubber erasers
A set of 2"-3" medium duty "C" clamps

Chapter 4

General Repair Work

How to clean a gun barrel that has been fired with smokeless powder ammunition and jacketed bullets is a subject that has been covered many times, in many publications. Since we will be dealing primarily with 19th century weapons, that is a topic which we will not dwell on. Instead, we will go right into the nitty-gritty of how you can effectively clean out black powder residue from older weapons, since these processes are so often overlooked.

Both black powder and Pyrodex can leave some nasty fouling in the bore and if the shooter wants to maintain accuracy, all of it will have to be cleaned out. Author photo.

How corrosive is black powder? Back in Chapter One we talked about how, when black powder burns within a gun barrel it only combusts some 43%[1] on average of its mass, so less than half the powder is actually turned into useable energy. The remainder, which is the other roughly 57% is left as solid residue (about 56%) and water (that last 1%.) Alright, so more than half the powder from the shot that you just fired is still in the barrel, only now it is in the form of a sooty mess which has coated the whole interior (along with some of the exterior) of the barrel. What will happen if that sooty mess of black powder residue is not removed? Today, this question begs an honest, modern answer particularly in view of the commonly held belief that black powder residue is so corrosive it will eat holes in the barrel in a day if it is not removed.

What You Fix!

Black Powder Cleaning Procedures, dummies, headspace, measuring.
Gun metal finishes, firearms restoration, the right color, where?
Grip and gun stock repairs.
Hammers and triggers.
Sights.

Frankly, the salts in black powder residue by themselves are not all that corrosive, nor have they ever been. Oh, to be sure, these salts are corrosive, but of themselves they are only mildly so. What the residue is however, is hygroscopic which means, as we spoke about in an earlier chapter, the residue readily attracts and soaks up moisture from the air . . . just like a dry cracker will if it is left on the kitchen table for any length of time. Moisture mixing with these residual salts will tend to form a mildly corrosive mix, but in most cases no real harm would be done to the steel until several days have past. So where is the notion coming from that this residue is so corrosive? And what about all those badly pitted gun barrels we have seen from the black powder era? The answer is and was priming.

It's all in the priming. Until roughly the early part of the 20th century and in some cases even later, the explosive mixture that formed the life of all cartridge primers and percussion caps was delicately manufactured from highly corrosive chemical compounds. It was this exploding highly corrosive priming compound which, intimately mixed with the greater quantity of mildly corrosive and hygroscopic black powder residue that did the damage to all those barrels. Especially in conditions of high humidity, this corrosive priming/gunpowder mixture quickly became wetted with atmospheric moisture, and it was this damaging mixture which leached directly onto the dry steel of the gun barrel where it soon rusted and pitted the steel.

Now you understand why guns from the black powder era are so often found with pitting in the bores and revolver cylinder chambers. But today's priming is called non-corrosive, so why do we still have to worry about black powder residue damaging a gun barrel? We don't, well, actually we do but not to the degree that we did with corrosive priming. As I hinted above, the black powder residue from a non-corrosively primed charge is only mildly damaging to the steel of a gun barrel, so unless it's raining cats and dogs or you are in 100% humidity conditions, you may normally safely leave the gun overnight before you clean it.

Safety first. Your first step in any cleaning procedure has to be

that you make absolutely certain the gun you are about to clean is unloaded. (See also, the disassembly procedures for specific gun models shown in following chapters.)

At home and clean; on the range. Black powder is filthy when it is ignited and will quickly clog the inside of a gun's barrel with a fuzzy, smelly mess of fouling. Even the black powder substitutes like Pyrodex can mess up a barrel pretty well after several shots. Powder fouling doesn't confine itself to gun barrels. Under pressure powder gases can easily find their way into the area the revolver's cylinder rotates on, and when it does the cylinder will slowly but surely, seize and cease to turn. Many shooters (including yours truly) have made the silly mistake of traveling to the shooting range, intent on firing black powder in their weapon but forgetting to bring anything with them from home so they can clean the fouling out of bore or to clear up some operational problem caused by powder fouling or debris from an exploded percussion cap. We don't think about this much, but back in the black powder era, people were aware that preparation was required. Anyone who traveled with a gun or who went to the target range brought what they needed with them to keep their machinery in order.

Well, it seems that lots of wonderful things can happen at the range when you are shooting with gunpowder and they all seem to generate some comment that is prefixed by "if only. . .". So, "if only". . . you were at home or the shop you would have exactly what you needed to clean that badly fouled barrel to restore your gun's accuracy so you could finish this match. Or "if only". . . you had brought some screwdrivers and cleaning supplies you could partially disassemble the revolver and clean the residue out of the base pin hole so you could get the cylinder to turn again. Do you have any idea how lucky you are? These are things which you might not ever have experienced if you were shooting store-bought ammo that was animated with smokeless powder!

This author learned the hard way that when you go to the range to shoot charcoal, you ought to bring along sufficient cleaning supplies, including solvents, patches, brushes, and water. You also should take along enough tools to disassemble and repair any of the minor glitches which will normally occur when firing black powder. This doesn't mean you should bring your entire shop with you, but you certainly can make up a small version of it that will pack into a plastic tackle or shooting box. Just as you wouldn't forget to bring the firearm to the range, don't forget to bring along the equipment you would need to solve almost any problem that might occur during the shooting session. You could save yourself embarrassment and anguish, not to mention considerable time; on top of that by coming to the range prepared you'll look like a pro.

Black powder cleaning methods. Before the gun can be cleaned, depending on what kind of weapon it is, it will probably have to be disassembled to some degree. After all, we have to be able to get to any areas that might have black powder residue on them so that residue can be removed. With muzzle loading guns of all types this means getting the barrel out of the wood, then removing the percussion nipple and or bolster. Whenever possible unscrew and remove the breech plug at the barrel's rear. Percussion revolvers would have the barrel and/or cylinder removed and the nipples unscrewed. Cartridge revolvers should at least have the cylinder removed.

Water based cleaning is the least expensive and the oldest method of cleaning gunpowder and many shooters still use it since it is still a perfectly effective method. Clean water will dissolve and flush away most of the black powder residues, acting on the sulphur and carbon as well as the salts. Here's how it works: flush the inside of the barrel and any other disassembled components such as the cylinder with cold water. This first step will flush a good bit of the loose fouling out and at the same time moisten and loosen the fouling that has adhered to the steel. Now we will flush the same areas with hot water. Try to devise a way to hold the barrel, cylinder or other parts so you won't be burned and use water that is as hot as possible. During this hot water step, make use of a stiff bronze cleaning brush to thoroughly scrub the inside of the barrel, the cylinder chambers and a stiff bristled toothbrush to scour the outsides of any areas which have residue deposited on them. Pipe cleaners will aid you so that tight corners and oddly shaped areas can be attacked and cleaned. A nipple pick should be employed, along with pipe cleaners when cleaning the nipples.

In a variant of this procedure, small parts such as revolver cylinders, nipples and the like may be boiled in a small container of clean tap water after going through the cold water flush. Every so often the cylinder or part is lifted from the boiling water (remember, you will have to devise some way to hold these hot parts. Small diameter wooden dowels and short pieces of baling wire can help with this) and scrubbed then returned to the boil.

Continue this scrubbing with the brushes and hot water for as long as "dark water" still runs out of the bore or off of the pieces. Once the water begins to run clean, again flush with hot water and this time scrub the bore and the cylinder chambers with clean patches, wiping the exterior portions with a wet cloth as well. Next turn the water off and start cleaning the bore, the chambers and any exterior areas with clean and dry cotton patches. Continue this until every facet and corner of the areas you are cleaning has been dried absolutely. When you have the whole lot dried, look it all over well. Any residue left will usually show up plainly when once dried and you may scrub it off with a dry toothbrush and cloths.

When you are certain all traces of residue are gone and the metal surfaces are completely dry, you may apply a light coating of metal preservative, or a good light synthetic oil to the insides of the bore, revolver

chambers and all metal surfaces. Cold water on a cloth, followed by another clean cloth soaked with hot water may be used to wipe and rub off any residue which has adhered itself to the wooden gunstock. After the wood has been cleaned and dried you may want to apply a drop or two of boiled linseed oil, then rub it into the wood with your fingers.

Solvent based cleaning. Some folks prefer this method which doesn't use any water at all. Run a cleaning rod with a patch attached to a jag that is soaking wet with any good black powder solvent down the bore, and if a revolver, into through each chamber. Let the solvent set for a few minutes to soften the fouling (this also gives the solvent a chance to run into the nipple threads or the threads of the breech plug, allowing easier removal) then remove the nipples and/or the breech plug if so equipped. Scrub the barrel's bore and the cylinder chambers with bronze cleaning brush that you have soaked with solvent; run this through making several passes back and forth, being generous with the solvent. You can also scrub external metal areas with a toothbrush and the same solvent while going after the insides of the nipples with pipe cleaners and a nipple pick.

Again, let your parts set for a few more minutes and then go after the bore and chambers with clean, dry patches until they come clean. If you have done a lot of shooting with this gun, you may find that you have to repeat the brush scrubbing with still more solvent to get out all the powder fouling. When your patches and cloths are coming out clean, dry everything with clean cotton patches and/or cloths and inspect for any areas of residue you might have missed. Lastly, apply a light synthetic gun oil or metal preservative. The weapon's wood may be wiped clean using a clean cotton rag slightly dampened with the black powder solvent, followed by a vigorous rub-down with another clean, dry cloth and a couple of drops of the boiled linseed oil rubbed in with your fingers.

A combination clean-up. This is the method I prefer, it seems to get my black powder guns the cleanest, in the fastest amount of time and uses both water and solvents, the procedure being a combination of both methods but using water only to flush away the majority of loose fouling, then switching to solvents. Start by flushing with cold tap water just like with the water based cleaning described above. Follow the cold water with a hot water flush and then switch over by using a stiff bristled bronze brush soaked with solvent to scrub the bore and chambers and the toothbrush with solvent on the other external parts. Finish this dual cleaning method by following the instructions outlined just above under solvent based cleaning.

Tough bore fouling. Occasionally you will run into a bore that has areas that are hard to clean, because of minor pitting or surface roughness, powder fouling, lead deposits or copper from bullet jackets, stubbornly clings to the rifling. Should you continue to fire the weapon with these deposits in the bore, the degree of barrel fouling will only increase; since these deposits act like magnets for more of themselves. If the fouling is very near to the muzzle or the breech end or the barrel, you may be able to reach in with dental picks and gently scrape it out, but what do you do when the deposit is not accessible? An abrasive of some sort would be the best remedy, but it has to be a very mild abrasive so the rifling won't be harmed. Brownell's sells a very useful product that has been the answer to many of these instances for me, it is called J-B Non-Embedding Bore Cleaning Compound and that (a cleaning compound) is exactly what it is.

J-B Bore Cleaning Compound... "with minimal elbow grease this product will get out even the last bit of debris..." Author photo.

J-B is an extremely mild abrasive in paste form that may be used on the outside of a tight fitting cleaning cloth cleaning patch that has been wrapped around a jag or it may be used as a lap with a cast soft metal slug. In my experience, with minimal elbow grease this product will get out even the last bit of debris that has adhered to the inside of the barrel, and that includes lead and pieces of plastic from shotgun wads. The abrasive in this bore cleaner is an oil-based paste, and is apparently finer than jewelers rouge so no damage will be done to the rifling. I have never seen any evidence that it leaves a residue.

Brownell's sells a stainless steel sponge that is not made like steel wool is, it's rather like a soft, but coarse steel scouring sponge and this works very well if you cut it into patches that fit on a cleaning jag so it can be passed through the bore. This method will remove surface rust and most deposits rather aggressively as it scrubs right down to the original metal surface but without removing any of the parent metal. For very badly leaded bores, try scouring the bore with the stainless sponge patch mentioned above which you have soaked with Shooter's Choice Lead Remover; this is a combination that will remove just about anything that isn't part of the original

barrel. Another way to remove stubborn fouling and lead deposits are to use Lead Remover Cloth. The cloth is chemically treated to remove lead, plastic and other kinds of stuck-on residue and are available from Birchwood Casey and others. Lead remover cloth is cut into suitably sized patches, this method can work very quickly in barrels that have excellent bores but it is not quite so effective when used in old, pitted bores.

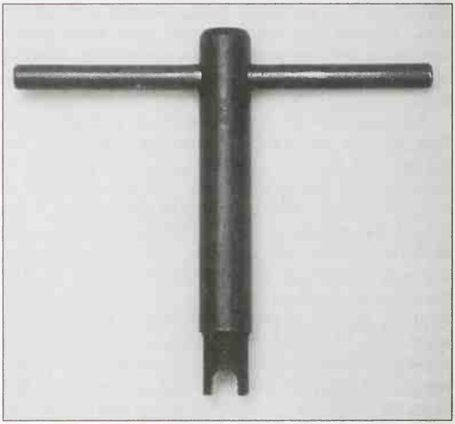
Pyrodex fouling. The original black powder substitute, Pyrodex is preferred by many shooters but that doesn't excuse it from fouling. Pyrodex, as anyone who uses it will tell you, will also foul a barrel with a residue that is seemingly very dry and quite "sticky". We have seen revolver shooters using Pyrodex who have loaded their cartridges with modern, soft lead alloy revolver bullets that have insufficient bullet lubricant that is also unsuitable for use with this propellant. Cartridge loads such as this, whether used in a revolver or rifle will lead the barrels badly, as well as leaving a horrible, messy grey residual coating that has to be physically scraped out of the rifling if accuracy is to be restored. In order to keep this residue and leading to the lowest possible levels, we have found that the use of liberal amounts of bullet lubricant which is intended for black powder, such as SPG Lube will work wonders. Using enough bullet lubricant also means that your choice of bullets should be made very carefully, with special priority given to the size and capacity of the grease grooves and to the alloy, which for general use should be at a ratio of just about 1 to 20: tin/lead.

Pre-treating the bore. One good method for reducing the amount of black powder or Pyrodex residue that will cling to your gun's bore is to treat the bore with something that the powder residue won't be so inclined to adhere to before a shooting session. We started pre-treating all our barrels that are used with black powder a couple of years ago with a product made by Brownell's called Moly Bore Treatment Paste. This product is based in the incredible friction fighter called molyldenum disulfide, if applied to the clean and dry bore as per the makers instructions, it provides the interior of the bore with a microscopically thin, super-slippery surface coating that as a side-benefit is also waterproof. While I have seen no measurable increase in velocity by applying this slippery stuff to my gun's bores, I immediately noticed a marked decrease in the amount of fouling build-up after a similar number of shots had been fired in an untreated barrel; and in the fact that most of the fouling in the treated bore would easily wipe out with a damp patch.

The bore treatment even helps reduce fouling on guns with barrels that have pitted bores, and as I mentioned above, the greatest benefit of the moly-treated bore is the ease of clean-up after you are all done shooting, that is especially true with a pitted bore. How long does a moly-treatment last? That would all depend on how many shots you are going to fire and how aggressively you scrub your barrel after shooting. I tend to scour the interior of my gun's barrels fairly heavily and the moly paste seems to last about two to three cleaning sessions before it becomes evident that the bore needs to be re-treated. Since the biggest pain in the neck associated with shooting black powder has always been the clean-up, the idea of moly bore treatment is something I would definitely recommend for the serious black powder shooter. Here is one instance when a thoroughly modern notion and product can work to enhance the performance of an ancient ritual.

General cleaning and range tips.

Percussion nipples and other removable small parts that you may have to clean because they have been subjected to powder fouling may be dropped into a small jar containing some clean black powder solvent and left to soak while you are completing the remainder of the firearm. Once you're done with the big work, you will find that each individual small item will clean up very easily after having been soaked in the solvent for a time.

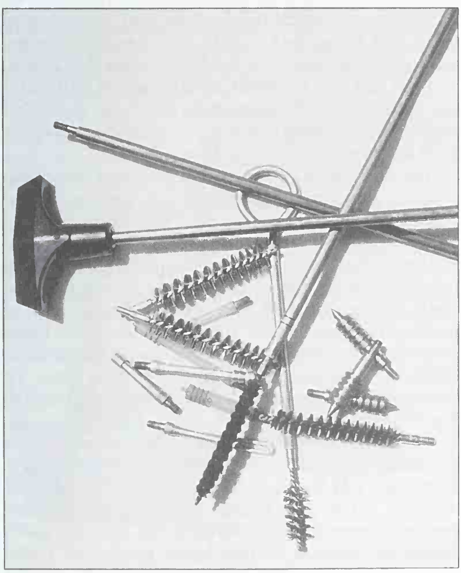


This nipple wrench from Dixie Gunworks is intended for the removal of percussion nipples from larger caliber revolver cylinders. Author photo.

All revolvers whether cartridge or percussion should always have their cylinders removed and disassembled for cleaning. Don't neglect to clean the center hole in the cylinder as well as the arbor or base pin the cylinder rotates on. Special care should be given to cleaning the inside of the cylinder opening in the frame, a toothbrush or even a stiff bronze bore brush soaked with solvent will work fine for these areas. One often overlooked spot is that area where the barrel threads into the frame which is loaded with little crevasses that hold onto residue and if applicable, be sure to include the firing pin or hammer nose area in your cleaning ritual. When cleaning a revolver's barrel on those guns with permanently screwed on barrels, keep the gun held upside down to avoid running water into the frame.

Top-break revolver barrels may not have to be removed from the frame for cleaning but just as with other revolvers, you will need to keep water out of the rest of the mechanism unless you intend to disassemble the entire revolver. Instead of removing the barrel, remove the cylinder catch and or barrel catch so that there are no more parts remaining in the barrel's top strap; and keep the barrel opened and upside down during the cleaning process, and keep the frame held up over the top of the barrel.

Rifles, especially lever action types that fire pistol cartridges should be disassembled to the point where the breech bolt and firing pin may be removed and given a thorough scrubbing with solvents if they have been fired with black or Pyrodex propellents. This is important to note because I have on many occasions observed substantial amounts of powder residue having been blown back into the bolt around the firing pin. It happens most often with pistol sized cartridges and in guns with loose chambers when there isn't enough chamber pressure to cause the cartridge casing to fully obdurate (expand to seal the chamber during firing) so powder gases leak rearward into the bolt. This powder fouling and the rust it generates, if left untreated may cause the firing pin to stick forward; that could cause a dangerous situation should the cartridge primer be fired before the breech bolt has fully closed and locked.



If you shoot black powder, be prepared and bring a cleaning kit with you to the range that will enable you to handle almost any cleaning job. Author photo.

Out on the shooting range. If your weapon's accuracy begins to deteriorate, take time out, stop your shooting and clean the barrel, and if you are shooting a revolver, also clean the cylinder's chambers. When you are finished cleaning; do not leave the bore or the chambers wet with oil or solvent if you are going to shoot the gun soon; instead dry the bore and chambers thoroughly with clean, dry patches before you load up again. With a dried-fresh bore, sometimes the first shot will be a flyer and you might want to fire one prep-shot before doing any serious target shooting. Sometimes called a "dressing shot", this will absolutely dry and partially foul the bore, while also coating it with bullet lubricant so the successive shots have what is called a "normalized bore" to ride in.

The working dummy

Is a dummy cartridge a stupid round of ammunition? No not quite, as a matter of fact a dummy may be the smartest piece of ammunition you will ever meet. *Are they like those crash-test dummies?* Well, sort of. You see, a dummy cartridge cannot do the one important thing that a live round of ammunition can; the dummy can't shoot. Therein lies the real value of those precious dummy cartridges.

As mentioned earlier, these dummies we are talking about here are in reality specially-made, but totally inert cartridges. Dummy cartridges look just like the real thing and they are shaped to factory dimensional specifications but they are specifically made without any powder, and with no primer. In some dummy cartridges even the provision for a primer pocket in the base of the cartridge case is omitted. U. S. government armories used to make their inert ammunition with holes drilled through them, and sometimes with full length flutes in their sides so that they could be quickly identified as dummy, non-firing cartridges. About now you are asking; *what could I possibly use a non-functional cartridge for?* Good question, but this one has several really excellent answers, and the most important answer is that these dummies could save your life.

Gunsmiths frequently have a need to check the function of a weapon's action or feeding system in the shop without actually having to fire the gun, sometimes the disassembly of a cylinder calls for the use of dummy cartridges, and they fit these bills to a tee. Here is a wonderful rule to follow that will help you to preclude even the smallest chance for an accidental discharge: Keep *no live ammo* in your shop, or anywhere near your workbench; ever. Anyone who works on guns for a living who has ever accidently put a hole in the shop wall or floor will understand my reasoning at once. But the hobbyist and the working gunsmith are not the only people who can put dummy cartridges to good use. Government armories, firearms makers, and law enforcement armorers and instructors are just a few examples of the many thousands of people who work on

or with firearms daily and who regularly make use of dummy cartridges.

Brownell's dummy cartridges come in many popular calibers and look like the real thing but are not capable of firing. They are the only cartridges you should allow on your workbench. Author photo.

For the firearms collector or shooter and if you have guns on display at home in a casing that includes ammo; dummy cartridges are the only kinds of cartridges that you should ever allow to be displayed with your weapons. Keep in mind that you will not be able to control access to the display at times when you are not present, and relying on locked gun cases to prevent accidents may not be as secure a plan as you think. It comes down to this simple equation; if there is no live ammo available with or near that weapon; then an accident can not happen because the gun can't fire without ammunition. Sportsmen, hunters and gun lovers often *fiddle around* with their own guns. I have both known and heard of more than a few foolish fellows who have run live rounds of ammunition through the action, offering up the lame excuse that they just wanted to check its functioning. Why in the world these people are not using inert, dummy ammo instead of live cartridges I cannot say, though I sometimes wonder if perhaps we haven't bestowed the title *dummy* on the incorrect character?

High quality, factory-made dummy cartridges are readily available and may be had in a large array of the most popular calibers from Brownell's Inc., the world's largest supplier of gunsmithing tools, equipment, and parts. Brownell's has told me that they sell hundreds of thousands of these inert cartridges each year to gunsmiths, the firearms manufacturers, law enforcement and to the military. These factory-made simulated cartridges are normally colored a dark matte brown, making them instantly identifiable. If you require inert ammunition for a gun that is chambered in a caliber that isn't available from commercial sources, dummy rounds are not hard to make for an obsolete or unusual caliber if you reload ammunition or if you know someone who does and they are willing to help you out. Their manufacture presents no more of a problem than trying to get someone to load live ammo in the same caliber. The re-loader would simply full length resize, neck expand and de-prime the case as usual, but instead of priming and charging the cartridge with powder; the bullet is loaded and crimped (if required) without any propellant and with no primer. You will want to mark those dummy cartridges soon after their assembly, so it will be easy for anyone (including you) to tell that they are inert and non-functional. For obvious reasons, we certainly don't want to be confusing them or mixing them up with any live ammunition. Drilling a 1/8" hole clear through the sides of the center of the empty case is one easy and effective way to identify the round as a dummy cartridge.

I would strongly encourage all gunsmiths, gun owners and in fact anyone that handles firearms for a living who may have to manipulate the weapon safely without firing it; to make it a habit to use dummy cartridges every day, as an excellent method of practicing smart firearms safety while handling, or displaying weapons for any purpose other than use in the field, on the shooting range, on the job, or for self defense. Whether you decide to purchase them or to manufacture your own non-firing cartridges, please play it safe; put this dummy to work for you today!

Headspace: what is it?

Headspace has little to do with muzzle loading weapons, it applies to those which fire metallic cartridges. Since this book is devoted to the repair of 19th century firearms, these comments on headspace will be confined to those types which for the most part used rimmed rather than the modern rimless cartridges. The simplest way to describe the word headspace when it is applied to a gun that fires a rimmed cartridge would be that it is the definition of the measurement of the space that should be maintained between the rear of the cartridge's head or rim and the front the breech face.

The description of the circumstances of headspace will vary somewhat with different gun types but the end result must be the same, to wit: The distance or gap between the back of the cartridge case and the front of the breech bolt in a repeating rifle or shotgun is called headspace. With a revolver this term defines the fixed distance that should be kept between the rear face of that cartridge rim, and the front face of the breech frame at the firing position only. While in single shot rifles or shotguns, headspace would be the distance from the rear of the cartridge rim to the front face of the standing breech or receiver.

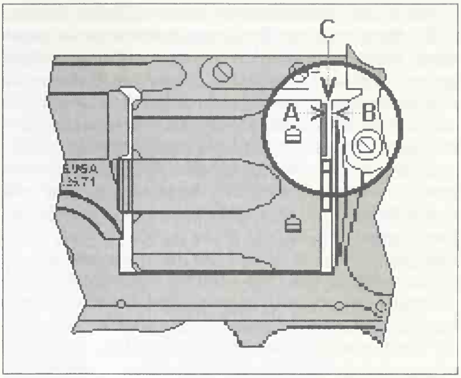
Once most people understand what happens inside the barrel and chamber of a gun when the cartridge is fired, they will find it easier to understand what headspace is. When the cartridge is fired, initial chamber pressure drives the bullet forward, the cartridge case's immediate reaction to that bullet movement; called "forcement," drives the cartridge case back into the breech face, and in that instant the high pressure in the chamber swells the brass cartridge casing to completely

fill and seal the chamber walls against any high pressure gas leakage. This action of the brass case expanding to seal the chamber is called case obturation. The gun and ammunition factories have already decided exactly how much headspace is required in any given gun and with any given cartridge, so that the cartridge case will be forced backwards "just enough" to allow the proper amount of case obturation to occur and no more. As the bullet speeds down and finally out of the barrel, the chamber pressure decreases and the brass casing shrinks back again, letting go of the chamber walls, but it does not shrink quite to the size it was before firing.

Let's look again at the headspace. In order for any firearm to operate properly there are some good reasons that this fixed headspace measurement should be maintained. One of these reasons is so that most of the cartridge casing will remain contained within and supported by the chamber as the cartridge is being discharged. If the headspace distance were too large, then the cartridge casing would back out of the chamber farther than intended under the pressure of firing; this could cause the cartridge case to bulge or to split and in such a an instance the case may fail to expand and to properly seal the chamber, then there would be a loss of chamber pressure. The loss of chamber pressure will mean a loss of muzzle velocity and often, a decline in accuracy.

Still another reason is that any headspace distance which is too great may allow the primer to back out of the cartridge case during firing, in a revolver this could prevent the cylinder from rotating and stop any further shooting; and with some falling block and tipping block weapons the over-expanded primer can actually bind the breech bolt closed.

When a revolver has developed an excess of headspace, then we know its cylinder has moved too far forward within the lock frame. In that case, excess headspace is allowing the cartridge case (and its primer) to move forward along with the cylinder, quite possibly to the point where the primer is too far away from the firing pin to give reliable ignition and then misfires or failures to fire will occur. The opposite of the above situation could be where there was too little or no headspace, in that case the cartridge rim could rub on the

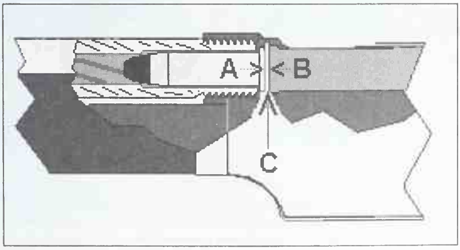


Revolver headspace. A~ Rear of the cartridge rim. B~front of the standing breech face. C~Headspace distance.

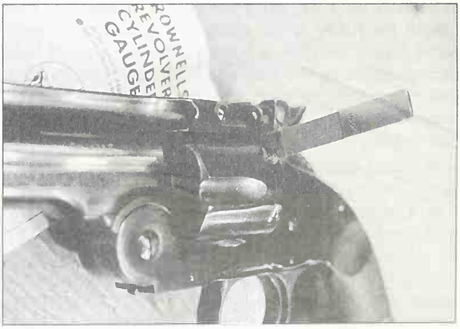
face of the standing breech and prevent the cylinder from rotating at all.

Measurement of headspace is done with tools called "headspace gauges". These are gauges of fixed thicknesses which in closed breech weapons (not revolvers) are placed into the chamber and then an attempt is made to close the breech. A "GO" gauge is of standard dimensions, a "NO GO" gauge is an oversize. The breech should close freely over the "GO" gauge but should not close on the "NO GO." If a breech does close on the "NO GO" gauge this is your indication that the headspace is in excess of factory standards and needs to be repaired.

With a revolver, the headspace gauge is placed into a cylinder chamber then the cylinder is rotated until the chamber gets to the firing position. Once again, if the chamber with the "NO GO" gauge can be rotated into the firing position, the revolver has excess headspace. An empty cartridge case can also be used to check headspace by sliding automotive feeler gauges between the



Repeating rifle or shotgun headspace. A~ Rear of the cartridge rim. B~front of the breech bolt face. C~Headspace distance.



This is the Brownell's revolver headspace gauge at work, to use the gauge it is slipped in between the rear of the cylinder and the breech face. Author photo.

cartridge rim and the standing breech with that chamber at the firing position. Headspace in revolvers is sometimes measured with what has been called a "bolster gauge," this kind of gauge is inserted in between the rear of the empty cylinder and the standing breech face and is made to take into account the thickness of a standard cartridge rim plus the headspace distance.

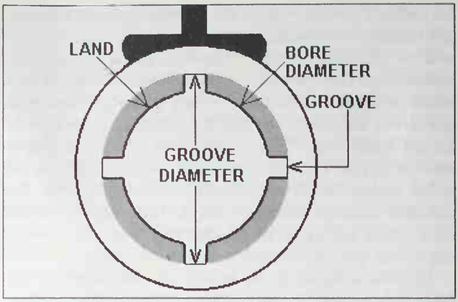
One final note, closely examine the breech face of a metallic cartridge revolver's receiver and you will notice the area just around the firing pin is slightly farther forward than the rest of the standing breech. If the headspace were measured on the chamber that is aligned with the firing pin, and then measured on all the chambers that weren't, you would find that all the others have a larger measurement. The gun standing breech of revolvers was designed this way so that the active primer and/or cartridge case may move to the rear or expand when it is fired but the cylinder will still be able revolve to fire subsequent shots since extra headspace room has been left in the rear of the other chambers. This method was first developed by Smith & Wesson in the late 1850s and it is still in use.

How to measure the inside of barrels and cylinders

Why would I want to measure the inside of a gun barrel? One very important reason for measuring the internal size of a gun barrel is to help us to determine if we are using the correct bullet diameter to get the best accuracy, as well as for safety reasons and to determine what caliber the gun is.

When we look at the inside of the hole through a rifled gun barrel we see that it has two diameters, that of what are called the lands and that of the grooves. The lands are the top of the rifling and their width is the barrel's bore diameter, in other words; the original drilled size of the hole through the barrel. So, the bore diameter is the width of this original drilled hole. Grooves are the actual rifling marks that have been scribed into the bored hole (into the bore.) The groove diameter, or bottom of the rifling is the width of this hole, now measured across the groove bottoms. Picture a small hole through a tube as the bore hole, with an imaginary hole that is just slightly larger than the bore around it. The imaginary hole would be the depth of the rifling, or groove hole.

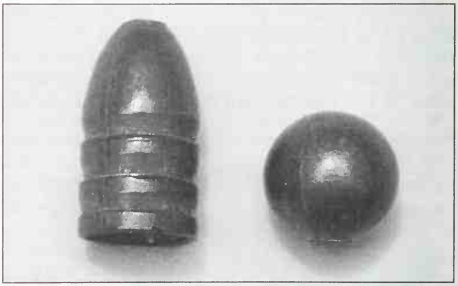
An ideal situation would be for a gun to use a bullet that is the exact size of this imaginary hole, that is the size of the barrel grooves, not of the bore hole. This way we know for certain that the bullet is being engraved by the rifling, and that it will seal the hole in the barrel so no propellant gases leak by it, at the same time distorting the bullet as little as possible. Some exceptions to this exist, but if you are after an accurate rifle or handgun, even those exceptions will have to contact the rifling at some point to impart stability and give spin to



The lands are actually the bottom or "minor diameter" of the rifling and is at bore diameter. The grooves are the top or "major diameter" of the rifling.

the bullet or the gun's accuracy will falter. On the other end of the scale, if a bullet of too large a diameter for the barrel were used, this bullet is being worked hard and it will have been distorted by being squeezed down beyond its design limits. In this case the weapon's chamber pressures might also rise to unsafe levels, spurred on by the additional work effort of moving the oversized bullet.

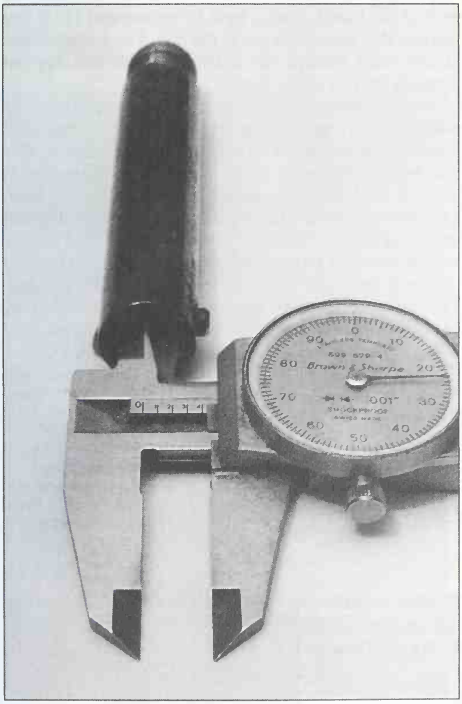
A great example of one of the exceptions to the above rule is the Minie bullet, made famous during the American Civil War. The Minie bullet was made the same size as the rifle's bore diameter, and it was what is known as a bore-rider while it was being loaded. This kind of bullet is made this way so they can be quickly and effortlessly pushed down the barrel of a muzzle loading rifle without encountering the resistance they would have if they had to be engraved by the rifling. Minie bullets are hollow based and made of soft lead, they are so designed that the hollow base will be expanded by the propellant gases when the weapon is fired; then the Minie's sides would increase in size to



Bore riding bullets. The base of the .577" diameter minie ball on the left was hollow which helped the bullet to expand fully into the rifling once the shot was fired; this allowed the minie bullet to be bore sized, making for easy loading from the muzzle. When the round ball was wrapped in a cloth patch, it was the patch that was engraved by the rifling, not the ball. Author photo.

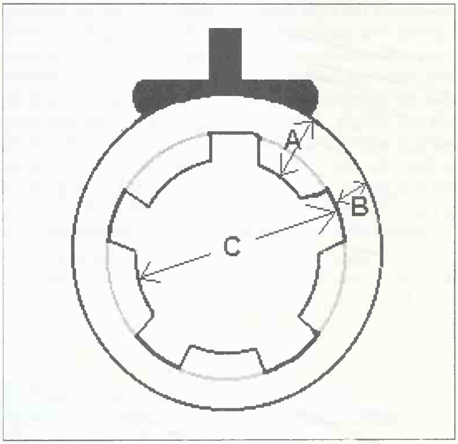
completely fill the barrel's rifling. A marvel in its day, this revolutionary bullet design offered fast muzzle loading in rifled barrels along with excellent accuracy. Yet another example of a bore-rider type of bullet would be the patched round ball used in a muzzle loading rifle, here the ball is tightly wrapped within a cloth patch. It was the cloth patch that engaged the rifling instead of the ball, which was intentionally made a smaller diameter than the rifling. Paper patched bullets were used in some of the old Sharps cartridges and they worked in very much the same manner. With both of these latter examples, the cloth or the paper was used as a sabot, effectively encasing and holding the bullet, while engaging the rifling for the bullet.

To get an idea how modern rifling and bullets work we can use the long popular 30-06 rifle cartridge as an example. With this caliber the barrel's bore size is .300", this was an exact .30 caliber. Now we will we will cut four equal .004" (four thousandths) deep rifling grooves into this .300" diameter bore hole. Our groove diameter is now .308" {.004" x 2=.008" + .300"=.308".} If we were to use a bullet that was a perfect .30 caliber, or .300" diameter to match the barrel's bore size, our bullet would never touch the rifling and the propellent gases would be leaking around the sides of the bullet. Instead, let's try using a bullet that is a perfect match in size for the groove diameter of this barrel, that would be .308" diameter. This larger diameter bullet will fill the rifling completely, offering optimum accuracy, and will insure that the high pressure propellent gases are where they belong; sealed up behind the bullet.



With barrels that have an equal number of lands and grooves, groove diameter may be measured at the muzzle end from groove-to-groove that is, across the widest points.

Barrel bore and groove diameters can often be measured right at the barrel's muzzle by using a dial caliper placed across the lands, then the grooves, just remember that you will only get an accurate measurement when your barrel has an equal number of lands and grooves, such as 4, 6 or eight. Different measuring techniques must be employed to measure barrels that use an unequal number of lands and grooves because it isn't possible to measure directly across these at the widest point. There are a few ways to do this, most of them requiring more expertise and tooling than the average fella' is going to have handy; this can be a tough one for the layman to measure. Here is one way that may work for you, this method will not produce a perfect measurement, but it will get you in the ball park.



One method of measuring a bore with an unequal number of lands and grooves.

Look at the illustration and the example for one way to measure a barrel with an unequal number of grooves. By using your dial caliper, measure the dimension at A, next measure the dimension at B. Subtract dimension **B** from dimension **A** to find the groove depth which we are calling **X**. Now measure dimension **C**. Add the total **X** which you found after subtracting **B** from **A**, to the dimension **C**. Now you know your barrel's groove diameter, which we can call **Y**. Find the bore diameter by multiplying **X by 2,** then subtract this total from the

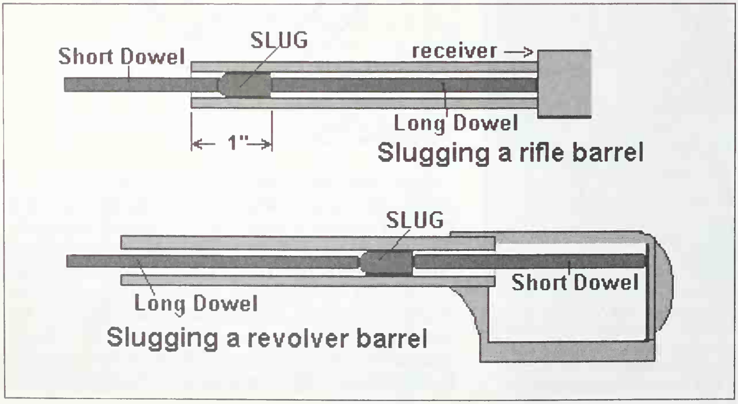
groove diameter Y which will give you bore diameter. After listening to all this X/Y stuff you may think I am a physicist, but I am not and you don't have to be either. The reason the above method may not be accurate is that unless the outside of the barrel is perfectly concentric with the bore (and they almost never are) the measurement will be faulty. What it will give you is a very close measurement, and you can take it using only a dial caliper.

A very good method to use to measure the inside of a barrel is to slug it, and then measure the slug. Slugging is when you drive a soft lead slug or bullet down the bore causing it to upset (to expand) and to fill the rifling completely. The slug is then driven out of the barrel so you have an inverted "picture" of the rifling that can be externally measured. Keep in mind that once the slug has been expanded it will turn with the rifling as it is being driven or pushed out of the barrel. One easy to make slug is to use a soft lead bullet of a caliber that is only slightly larger than the bore you want to measure. For instance, with a .30 caliber, that had a barrel with a nominal .308" groove diameter, you could use a soft lead bullet from a 32/20 that measured .311" for your slug.

During the slugging process, you will be measuring an area of the bore approximately 1" from the muzzle. Lightly coat this portion of the bore with gun oil. Find two hardwood dowels that are slightly smaller than your bore size, but longer than your barrel-action combined. One of these will be cut for use as tooling, one will be left full length. A length of one dowel is cut just long enough so it reaches to 1" of the muzzle when you drop it down the barrel, allowing the stick to bottom out on the bolt face if you are measuring a rifle. The lead bullet is placed on the muzzle and then hammered down using a plastic mallet until it is flush with the muzzle. Now a shorter piece of dowel that is about 3" long is also cut from the scrap of the first dowel. Use this as a punch to drive the bullet or slug down into the barrel until it contacts the dowel already in the bore. Now that the slug is in contact with the dowel in the barrel, hit the short dowel hard three or four times to upset or expand the slug into the rifling. Now remove the bolt, and use the longer, uncut length of dowel to drive the bullet out of the barrel muzzle from the rear. You may want to have some soft rags on your bench top as padding for the bullet to fall on to keep it from being damaged. You should have a perfect slug which has been formed into a male version of your barrel's interior that can be measured very easily.

Slugging a revolver barrel: you will first remove the cylinder and then coat the whole length of the bore with a light film of gun oil. You will measure an area about 1" long from the rear of the barrel, but in order to do this the slug has be driven all the way through the bore because a revolver barrel is not easily removed, and there is very limited access from the rear. Cut a short piece of dowel that you will drop into the bore so it falls against the breech face and sticks up into the bore about one inch. Now drive your soft bullet into the barrel's muzzle end, all the way down until it stops against that short dowel. After upsetting the slug as described earlier, remove the short piece of dowel out through the rear of the barrel; it may have to be snapped off if you are not able to angle it out to the rear. The longer dowel is now used through the muzzle to drive the slug out through the rear of the barrel.

There is another good way to slug a barrel, that is by using a low-temperature casting metal, like Brownell's Cerrosafe to actually cast a slug inside the barrel. This low temperature alloy melts at only 158-190 degrees F. After it hardens it shrinks for about the first half hour, but after an hour it will be exactly the size and shape of whatever it was melted in. Gunsmiths regularly make use of this alloy to measure rifle chambers. You can use the same methods we outlined with the soft bullet slug, but this time the bore is plugged at the dowel-top by using a soft pine plug about 1/4" long that you have

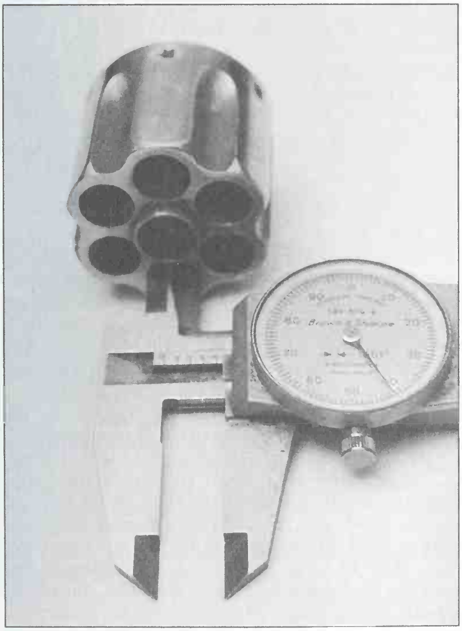


To slug a barrel a soft lead bullet or "slug" is driven down the bore and then it is manually expanded or "upset" to fill the rifling completely. The slug is measured after removal to determine the barrel's exact bore and groove diameter.

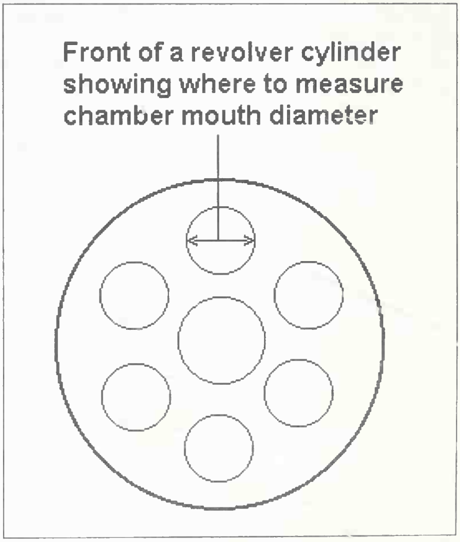
whittled to fit tightly inside the bore. Pour the hot Cerrosafe into the barrel, and only use enough to cast a slug about one half inch long. After the slug has cooled for a few minutes, the rear dowel is removed and the Cerrosafe slug is driven out along with the pine plug in just the same way as the bullet-slug was earlier.

A benefit of the slugging process is that it allows you the option of pushing a slug all the way through a barrel so you can check its interior for smoothness and bulges by noting differences in resistence. While you are pushing the slug through the barrel you may find a loose or tight area in the rifling that may have gone unnoticed if you had only measured the muzzle. A too large or a small area in a barrel can play havoc with accuracy, it may be the result of a manufacturing defect, or it may have been caused by someone having fired the gun with an obstruction in the barrel, causing a slight bulge that might or might not be visible on the barrel's exterior.

We can also measure a revolver cylinder's chambers to find out if they are the same size as the barrel's rifling. In a revolver this is a much greater concern than with rifle barrels, because a revolver's cylinder is machined apart from the barrel, the rifle's chamber of course, was machined into the barrel. What this can mean is if the chamber mouths in your revolver are a different size than the barrel groove diameter, this can have a profound effect on the gun's accuracy. A revolver's chamber mouths may be measured by using a dial caliper across the area shown in the illustration. With percussion revolvers the cylinder chamber mouths should be measured to determine whether you are using the correct ball size to effectively seal the chamber, also to prevent the phenomena of chain firing (multiple chamber ignition) which could ruin your day along with your gun. When loading a percussion revolver always pay special attention to select a ball size that is one thousandth of an inch larger than the diameter of the cylinder chamber mouths; or at the very least the exact chamber size, then the ball can be forced to seal the chambers when it is rammed home. Another area you shouldn't overlook is the use of either a tight fitting over-the-powder lubricated wad, or over-the-ball black powder grease lubricant; some very cautious folks use both. Either of these methods will provide the required bullet lubricant, offer an easier cleanup with less barrel fouling as well as offering greater insurance against a chain fire.



This is the correct location to measure the inside diameter of the cylinder chambers; the chamber mouth. Author



Barrel Groove Diameters

Key: ACP=Automatic Colt Pistol. C.F.=Center Fire. mm=millimeter. perc=Percussion. Rem=Remington Win=Winchester. WCF=Winchester Center Fire. WSL=Winchester Self Loading

.22 Rim Fire	**.222"**
25/20 WCF	**.257"**
.30 caliber rifle	**.308"**
.31 percussion Colt	**.313"**
.32 ACP	**.311"**
32/20, 32 S&W	**.312"**
.32/40 & Special	**.321"**
.33 WCF	**.338"**
.348 Win	**.348"**
.351 WSL	**.352"**
.38 Special/.357	**.357"**
.36 percussion Colt	**.375"**
38/40	**.400"**
38/55	**.379"**
.401 WSL	**.406"**
.405 Win	**.412"**
.41 Colt	**.406"**
44/40	**.427"**
.44 percussion revolver	**.451-.457"**
.44 S&W American	**.434-.436"**
.44 S&W Russian & Special	**.430"**
.444 Marlin	**.430"**
.45 ACP	**.451"**
.45 Colt	**.452-.454"**
.455	**.457"**
45/70	**.457"**

Gun Metal Finishes

History and explanation of gun metal finishes. An important part of the love we have for fine old guns involves a deep appreciation for the beautiful finish work exhibited on the many of the older firearms. In all the years I have spent working as a gunsmith, the questions I have been asked about metal finishes must number into the thousands. I used to think, how hard can this be to understand? The truth is, with all the time I have spent over the years in explaining how the various processes were used to achieve familiar finishes on older guns, I have discovered that even when the simplest of explanations is used this is a far larger and more complex subject to decipher than we might at first assume. In this chapter I will be offering you a few thoughts on these lovely old finishes, what they were called, the basics of how they were achieved and why different colors may observed, as well as some hints on how to gauge whether or not the finish you are looking at is a factory original.

The darkening of steel on firearms was, and is, done for various reasons:

A) in order to reduce glare, not only so as not to distract the shooter's eye from the sights but, to prevent that glare from being reflected to one's target, be that game or enemy.

B) to provide some measure of protection against the elements.

C) for purposes of decoration.

On the other end of the spectrum, quite literally; bright plating such as nickel, silver or gold would obviously fall under the heading of decoration with gold and silver being status symbols. At one time though, the nickel plating of a firearm was also considered the ultimate method of rust proofing. Other finishes, such as color case hardening or what some have called the old Winchester "rainbow" colors, were originally used for still another, more utilitarian reason, which we'll elaborate on just a bit later in the chapter.

Let's begin by looking over the finishes you will encounter most often, and see what we can do to identify them. Understanding the names we use for these finishes can get pretty dicey, but try to keep up, I promise to fill in the blanks further on: First we have "blueing", which until recently, was called "browning" by the British, however in more modern times they've chosen to call it "blacking" and the color is, in fact, genuinely in the black end of the spectrum. Then there is what the British formerly called "russetting", and what we Americans call "browning"; which is really a russet-brown. Today, the modern process in common industry use which is called "blueing" is, in actual fact; *very black*. Are you confused yet? Come on in and join the club, you are not alone. Now, the American terminology used for the blackening of gun steel has always been generally known in this country as blue or "blueing", and so; that name is the one that I will use here for this entire generic category of black in so many shades, and the blue-black seen on some of the guns of yesteryear.

Blueing, browning, russetting or blacking are all names for what is actually an oxide of iron formed of the metal's surface. Did you notice that I said "formed of," not on the metal's surface? That's right, these processes are mostly a controlled rusting of one form or another which end up achieving a *ferro-ferric*, *magnetic* or black oxide in and of the top surface of the steel which of itself. So this is not a coating on the steel like electro-plating or paint would be, it is rather actually the top surface of the steel that has undergone a chemical transformation, and of itself this oxide surface does offer some protection against further oxida-

tion, and so we call it *rust-resistant*. Actually, all of modern industry excepting us "gun people" call the blueing process "black oxide"; which in reality is its most accurate name. You will also hear this contemporary blueing method called "hot tank", "hot caustic", or sometimes "hot bath" blueing or blacking. This 20th century process is the quickest, and the most efficient and economical method of producing a black oxide finish available today, and it lends itself well to mass production, so it is for these reasons that nearly all the gun companies and most gunsmiths use it exclusively. Some gunsmiths and a few fine gun makers still make use of variations of an older method that is known as "rust blue", or "slow rust blue". Rust blue is the lovely, almost regal looking satin-black that you will have seen on a fine English or on American Parker shotgun barrels. That process required a good bit of tedious hand work and time, however it paid off by producing a very pleasing, and extremely durable finish, which is befitting of even a "best" grade gun. If I am not mistaken, Remington was the last of the large American gun manufacturers to use this blueing method on a large scale for production guns.

Other methods formerly used by the arms industry were types of temper blues called, "charcoal" or "Carbonna" blue. I have lumped these together for although different methods are used to achieve each result, in many cases the finished appearance can be almost identical; an extremely deep black to blue-black color, usually in very high gloss; seeming almost like looking into a black pool. One other method of blueing that deserves mention is "nitre", or "niter blue", A.K.A. temper blue. This form of "blueing" is *actually blue* in color. Done correctly it is a very deep true-blue, and is perfectly translucent in most cases. You may remember seeing an old Colt with a hammer or trigger that struck you as if it almost must have been painted with the finest translucent blue lacquer? That was nitre blue, it was certainly pretty . . . very labor intensive, not normally the most durable finish, but always pretty.

These old blue finishes have largely given way to the modern "hot caustic blue" technique, owing more to economics than to any other reason; after all, more gun parts can be colored faster and less expensively by this method than by any other. Not that it may seem this would cheapen the quality but that is not necessarily so, nor is it a bad thing, modern blue finishes wear very well indeed, not quite as well as some of the rust-blues of old but well enough to be quite serviceable. Given proper metal preparation beforehand, guns blued using the more modern techniques can also be excellent to look at. With hand labor costing more all the time, one can't throw too much "mud" at the gun manufacturers who, after all, have got to make a profit to stay in business. While we all long for the old days of beautiful hand fit and finish, the truth is that darned few of us would actually be willing to pay what it would cost to get them back.

Lets go into a bit more depth and define how the older finishes were achieved and what their actual colors were, in so far as that is possible with words. It is important to remember what we mentioned earlier, that all of these darkening processes are a form of *oxidation* of gun steels. Unless they are continually kept in a controlled humidity environment, without exception, they all will continue to oxidize to some degree; that means their colors do change with time. Without regard to the process used; if the surface of the steel is a formed, oxide it will continue to oxidize.

Browning (a light bronze-brown to plum brown color). This was probably in use at least on some scale from about the mid 17th century and likely even earlier. Originally termed "russetting" by the British, the process is started by applying an oxidizing agent (usually a terribly poisonous, acid-mercury based brew) to the absolutely clean, bare steel of a gun barrel. The oxidizing agent caused a fuzzy rust to be formed on the top surface of the iron (steel), this "first rust" is known as ferrous hydroxide, a.k.a. *red rust*. The rusting barrel or part was then placed in a controlled humidity environment known as a "damp-box" for a period of time; here in this warm-moist atmosphere the first or red rust is gradually converted into *ferric oxide*, generally a russet-brown, fuzzy-furry appearing coating, although light in color at first application. This fuzzy-furry orange stuff was carded or rubbed off with steel wool, the parts were again cleaned and the rusting process was started over again. Repeated applications of this process over time, produced a deep or rich brown coloration. This brown finish is somewhat rust resistant, but, and perhaps of more importance, it offered military weapons of the day a non-reflective finish. The British found this metal finishing method particularly advantageous, and used it for years on the muskets which the world came to know as "Brown Bess". European and American gunsmiths used similar processes, making use of oxidizing agents which ranged from simple vinegar or table salt solutions, to some much more complicated alchemic concoctions containing mercury and acids. Some early accounts reveal that one of the processes used to finely plum-brown Kentucky rifle barrels included browning by use of urine, human and otherwise.

A great disadvantage of this process is that, unless the oxidizing agent has been completely neutralized and the metal sealed against the elements after the process is finished; the browned steel will continue to rust. In practice, whether they were used for military or hunting purposes, most gun barrels were always being handled and wiped with oily rags during their use, and this tended to render new formations of ferrous hydroxide down to a minimum, hence the browned colors as a rule, stayed relatively well intact.

What is rust blue? The next process we will look at chronologically is rust blue, whose colors tend toward a rich, lustrous opaque black into shades of brown-black, always with a subdued satiny gloss. Rust blueing is

accomplished exactly like the process that I have described above for browning, with one very important addition: When the rusting parts that are covered with *ferric oxide* are submersed into boiling water or steam the russet-brown colored ferric oxide will be converted into *ferro-ferric oxide*, a.k.a.: *magnetic oxide*, which is really very black. In order to promote an even and consistent coating of rust, a controlled environment called a *damp-box* was normally employed. A damp-box was simply a closed box that was made large enough to hold whatever parts were to be blued and having a door for an access. Inside the damp-box was a small heat source (such as a light bulb), a source of moisture (a bowl of water) and somewhere around the box on top; a small ventilation hole. In practice, the parts, once coated with the rusting solution, were hung inside the damp-box and its door was closed; the interior of the damp-box providing exactly the right set of circumstances to promote the uniform rusting of the parts.

This process we call rust blue has been in use since about the early part of the 19th century. The exact time of its discovery is as elusive as the discoverer, but it seems to have occurred in various areas of the world at around the same time. I am sure that the procedure for making black oxide must have been used earlier than this period, since we have seen sporadic examples of original arms from far earlier periods which appear to be rust blued. It's more common usage though, seems to have spread in about the early 1800's. The basic rust blue process, or variants thereof have been called many names; rust blue, slow rust blue, express rust blue, Belgian blue and brown-black. Until recently the British referred to rust blue as "browning". Today, I am told they commonly call the same process "blacking". I did warn you earlier that this might be confusing. The business of coloring metals by heat and chemicals was one of the archaic arts which grew out of the alchemists laboratories and ancient armorers shops, so these old British terminologies stuck because during that time Britain was still an empire and was (arguably) considered by most of the earth's people to be the center of the civilized world.

Probably all of the world's major gun companies and military organizations have used the rust blue process at one time or another. In recent times it has largely fallen by the wayside because it is expensive and time consuming, so it has inevitably been replaced by faster less expensive methods. Rust blue does remain the most durable of all the oxide finishes. Some double shotgun barrels are still blued by this method since the gun barrels are heated no hotter than the temperature of boiling water, so there is no chance of the heat from blueing damaging the barrel/rib joints if they are held together with soft-solder that might melt in the 300-degree range. With the higher temperatures that required for the more modern caustic bluing methods to work (about 292 degrees Fahrenheit) we would be taking a big chance that the lead based soft-solder used to fasten shotgun barrels and ribs together would melt. To gain a clear understanding of what a finely prepared rust blue finish actually looks like, examine a set of older double shotgun barrels such as Parker, L.C. Smith or Purdey, this is the finish that was used to blacken those lovely barrels. Pay close attention and you will note some color variations on different guns since it is possible to vary the shade produced by altering the formulae of the oxidizing agents, so that brownish-black, or a very dark bluish-black is achieved, some different kinds of steel may also exhibit slight shade variances, the normal color produced however is rich black. This wonderful old process, which has so often proved itself to be a very practical method for use by small gun shops and amateurs alike, is covered in greater detail just a bit later.

***New* gun blue.** By this I am referring to the 20th century so-called caustic or hot blue that I am sure we have all heard at least something about. Caustic blue's color is, depending somewhat on the sort of preparation treatment that has been given to the metal surfaces, varying shades of black. This is the process that is today the world-wide industry standard and in spite of any bad reports, given the right preparatory work, it actually can produce a very lovely finish. With the hot caustic blue process, the prepared and cleaned steel parts are placed into a highly caustic, super-saturate bath consisting of a solution of water mixed with what is essentially a strong lye-like compound which has been brought to boiling at very nearly 300 degrees Fahrenheit. After a few minutes in this boiling solution, a *ferro-ferric oxide*, a.k.a.: *magnetic oxide* is produced on the surface of the steel that is very similar in nature (at least chemically) to the oxide produced by rust blueing, but is not as deep, hence not as durable as slow rust blue.

There are many who will come down hard on this "black oxide" hot caustic blueing by placing it in the same category as disposable plastic. I wouldn't go quite that far. True, modern blueing is not as beautiful as charcoal blue nor is it as durable as slow rust blue. Modern blue is quite durable however, and if the metal preparer spends ample time and care, a very beautiful finish can be achieved that is almost as nice as either of the above. As we mentioned near the beginning of this bit on metal finishes, what these new fangled blueing methods have done is to offer the large firearms manufacturers and many small gunsmith shops alike a cost effective, repeatable blueing process that is of very good quality. The fact is, in order for any metal finish, regardless of its type to look good, it has to be given proper surface preparation before it is blued, color hardened or even painted. Any professional will tell you its almost all in the prep; the better the prep work, the better looking will be the final product. We pay a good deal more for hand labor today than we did 100 years ago, so far from being a "cheap plague", the fact that we have this fairly inexpensive method of producing the surface oxide on weapons has been a real economic boon for

the industry. Think about it, if they still had to be finished the old fashioned way; you would not find many *inexpensive* hunting rifles for sale for under $1500..

Charcoal blue and Carbonna blue. Both of these bluing methods appear as being very glossy black to blue-black in color, deep and often nearly translucent in appearance. These methods are in the category of being oxides, but rather than being formed strictly by the use of chemical oxidizing agents, they are formed by action of heat and chemicals together in a controlled process that requires great experience and skill, and in the case of Carbonna blue; some very expensive equipment as well.

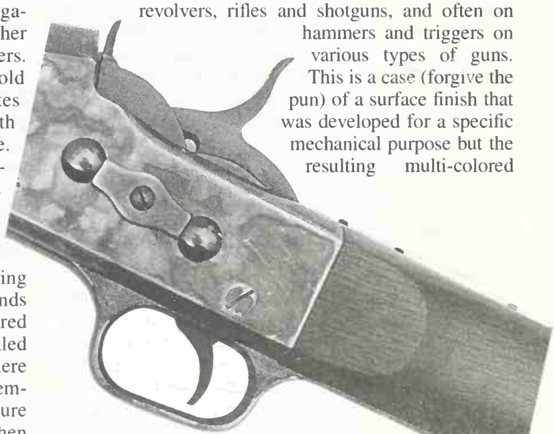
With charcoal blue, the prepared metal gun parts are heated in glowing, burning charcoal. As heat colors begin to appear on the metal, the parts are quickly removed and wiped with lime or oily rags, and as quickly as they were removed they are placed back into the heat. The whole process is repeated over again and until exactly the desired colors were obtained. Most of the early Colt percussion revolvers, Winchester receivers and early S&W's were blued using variations of this method. Sometimes collectors run into odd combinations of blue colors on guns; a good example being Winchester lever guns, which seem to have two different colors, or shades of blue, between the barrel/mag tube and the receiver. On a regular basis it seems, these same guns are found with lots of blue on the barrel and magazine tubes, but with none remaining on the receiver. Yes, two different bluing processes were used, and the probability of a different steel alloy from the barrels being used in the receiver also exists. As far as I can tell from observation, and from available source materials, the barrels and magazine tubes on these guns were rust blued, while other blueing methods were certainly used on the receivers. I am sure that one of these was Carbonna blue. An old friend and fellow arms restorer, Bill Adair, speculates that most receivers were charcoal blued along with the rust blue barrels and magazine tubes and I agree. It is evident that most of the major gun manufacturers experimented with various blueing methods throughout the years. Good food for thought, and yet another reason to be thoughtful in your examination of older weapons.

Carbonna Blue: Although sometimes appearing very much like charcoal blue, Carbonna blue tends more towards deep black. In this process the prepared parts were placed in a special retort (a large sealed oven, in this case a special rotating furnace) where they where heated to what were called "oxidizing temperatures" of 700-800 degrees Fahrenheit. A mixture of bone (charred bone meal) and carbonia oil was then added to the retort. At this point temperatures were lowered to 500-600 degrees Fahrenheit, and kept there for several hours, all the while the retort rotated continuously. The furnace was then turned off and allowed to cool, the parts removed and dipped in sperm oil.

Carbonna blueing was also referred to as a "tempering finish" because it served to combine the tempering of the steel while providing an oxidizing surface finish all in one. We have heard some reports that Carbonna blue was in use during the 1880s, but we doubt this. In fact, according to *"The American Society of Metals Handbook"* from 1939, the Carbonna blueing process was developed by the American Gas Furnace Company in 1904-1905. To my knowledge it was used to some degree until about World War II by most of the larger gun companies in the United States. In addition to attaining color by a combination heat/chemical process, Carbonna Blue had the effect of actually impregnating the metal surface with carbon. The end result was this lovely high gloss black finish, which we now know; also has a tendency to flake off in great patches with age. I can only suppose that this flaking may be due to excess carbon impregnation in certain areas of the metal rather than others.

Now largely obsolete, mostly on account its very high production costs, the Carbonna process like rust blues has been replaced by modern methods. Likewise going defunct these days is the commercial charcoal blue process, largely on account of the large amounts of skilled hand-labor and time it takes to produce. There are a few gunsmiths and small gun companies who still practice this fading art, but for the most part it is becoming lost to history.

Color case hardening (IE: mottled-multi colors ranging from grays to brown, with salmon, blue and yellows in subdued shades.) This look is what Winchester at one time called its "Rainbow Colors". We can observe color case hardening commonly on the receivers of some revolvers, rifles and shotguns, and often on hammers and triggers on various types of guns. This is a case (forgive the pun) of a surface finish that was developed for a specific mechanical purpose but the resulting multi-colored



A color case hardened receiver, typical of the sort found on many 19th century firearms. This is a Pedersoli manufactured replica of the Remington Rolling Block. Rifle courtesy Navy Arms. Author photo.

oxide formed such pleasing hues that it was also used for decoration and made a wonderful contrast with wood and blued steel.

For the practical reasons, case hardening was done to achieve a "case" or coating, that was a layer of hard, high carbon bearing steel on the outside surface of a part which would remain, in theory, soft and malleable inside. Their goal was to produce a part which had excellent surface hardness qualities and high resistance to wear, though at the same time was not so hard as to be brittle, hence the "soft" malleable core with a hard "cased" shell. Our hard oxide "case" is produced by heating the part(s) to a fairly high temperature in a sealed iron retort along with high carbon-bearing materials (such as bone meal, leather scraps, bone scraps, etc.,) holding it at a fixed temperature for a time and then quenching the parts quickly in brine, water or oil.

Those beautiful mottled colors were actually achieved by very carefully controlling the quenching of those hot parts in agitated and/or aerated water, in a water/brine solution or in oil. Controlled quenching in brine or oil brought about still different hardness qualities and varying colors, ranging from greys into mottled black. For instance, it is known that Springfield Armory used an oil quench on those mottled black Krag, and early 1903 Springfield strikers. There are other methods and mediums that have also been used for that all-important quench step, such as cyanide. These other methods however, particularly in the case of cyanide, do not produce what we would call satisfactory decorative colors, nor is the case-coating as deep or as hard as it is with the process described above, which was commonly known as the "bone and charcoal color case hardening" process.

Brownell's Inc. is now offering the equipment that will enable you to perform bone and charcoal color case hardening. While the larger shop may consider offering color case hardening as an option, I would personally discourage it. Both on account of the expense, and the high temperatures involved (this means that you need a dedicated area in your shop that is fireproof and actively vented), my suggestion is that this really is something you should seriously consider farming-out to one of the few expert companies, such as the *Color Case Company* who specialize in doing nothing but this kind of work.

Nitre blue. Nitre or niter blue was really a heat blue, or temper blue color that was achieved with a process using "niter" (archaic spelling nitre), hence its name. In this, the prepared polished and cleaned parts were immersed in a bath of molten potassium nitrate; the chemical compound that used to be known as "saltpeter." The niter itself did nothing, other than of course, to provide a controlled medium in which to heat the parts to such a consistent temperature that a deep, translucent blue could be consistently achieved, usually at around 550 to 650 degrees Fahrenheit. Once the parts had reached the desired color they were removed from the molten niter solution and quenched in water or oil. According to some sources, sometimes a darker shade was acquired by coating the colored parts with sperm oil and heating them for one hour at about 300 degrees Fahrenheit. Colt, Smith & Wesson and other gun companies actually blued whole revolvers using this process. Many gun makers used nitre blue to color small parts such as hammers, triggers, extractors, screws, pins and the like.

Equipment and chemicals to perform nitre blue are also available from Brownell's, Inc. and the process is not as difficult as you may imagine, but due to the high working temperatures involved, you must adhere strictly to all safety cautions. Having a dedicated area of the shop for this work is mandatory and you should require a high ceiling (because of the high temperatures spewing from the top of the nitre tank) along with adequate ventilation for the fumes and excellent lighting. This is not an especially economical or practical process for nitre blueing only one or two small parts at a time, and you would probably want to accumulate as many small parts as possible before running the nitre blue tank; just to make it more worth your while. The exact temperatures that the translucent blue color will appear may be found to vary. Some of the variance will be on account of different atmospheric conditions on different days, some will be on account of differences in steels or in the thermometer you are using. Generally though, in my experience the pretty blue colors will appear between 550 and 615-degrees Fahrenheit but you will have to experiment on your own to determine at what temperature the strongest color appears and what you think looks the best. It is not possible to stress strongly enough the importance of excellent overhead lighting when you are attempting this nitre blue process; you absolutely, positively have to be able to see those colors, it is equally important that you see them "as they occur" since it only takes a few degrees of temperature change for that illusive *perfect shade of blue* to be lost. I try to use strong incandescent bulbs, with none of these placed directly over the tank where the rising heat might cause the bulb to explode, instead they are situated around and well above the top of tank.

The quench tank. Please listen carefully to this; when you quench you are trying to move really hot parts from perhaps 600 degrees or more rather quickly into a tank full of room temperature water or oil. I want you to think for just a moment about what might happen if cold water or oil from the quench tank happened to splatter into the molten nitre salts at 600 degrees because the quench tank was too close to the hot salts. If you think there would be an explosion you are correct and even the notion of that prospect is not any fun. So by all means, place your quench tank *thoughtfully*! I keep my quench at least six feet away and on the floor, fully three feet *below the level* of the hot nitre tank. In this way the quench is close enough to access very quickly in a downward motion but it is still far enough away that any splatters can't reach the hot nitre tank. Also, I use one of those great big, deep

boiling pots, the kind they cook Maine lobsters in, for my quench tank. These are very deep pots and if you fill one half full of quench liquid, it is even less likely to spatter on account of those high sides. Another benefit is that these pots come with covers, so if you are using oil for your quench it can be covered and it will stay clean.

Don't mess around during that quench operation for timing is all important; pull the part out of the nitre bath and move smartly in one fluid motion directly down into the quench tank. You may quench most parts in water, although this may produce a somewhat lighter color after quenching than it appeared to have when you first removed it from the tank. In my shop, I have become quite fond of an oil quench where I use Mobil One©, a synthetic motor oil. This oil costs about five bucks per quart at service stations, so it may cost you a twenty dollar bill to about half fill that Maine lobster boiling pot. With most steel parts (but not all) the nitre colors seem to remain darker and more consistent when this oil quench is used. Some of the older reports which describe the nitre blue process also mention an "after bake", where the parts, after being quenched were coated with sperm oil and baked at 300 degrees for an hour. That might sound foolish but we have seen that with some older parts, small pieces from cap-n-ball vintage colts and the like, a still darker blue may be achieved after the quench by wrapping the oil soaked parts in a sheet of stainless steel foil (another Brownell's item) and baking them at about 300 degrees for an hour. We can't get sperm oil these days but the modern Mobil One© synthetic oil seems to work very well for this.

Straw colors. The so-called *straw colors* or *temper-tans* that are to be seen on some 19th century Smith & Wesson triggers, and more commonly on other small parts found on Lugers, Mausers and the like are also in the category of temper colors. These tan or *straw* shades were brought about in exactly the same manner with as the niter blue process described above. The prepared parts were immersed in a bath of molten potassium nitrate but removed at slightly lower temperatures of perhaps 450 to 500 degrees Fahrenheit as the desired tan or straw colors appeared and then removed and quenched in water.

You may produce very even and accurate straw colors by using the same equipment used to produce nitre blueing described above. The only difference in the two process' being the lower temperatures at which the parts are withdrawn from the bath and quenched. As with nitre blue, the exact temperatures required to produce a good straw color will vary depending on the steel you are coloring and the atmospheric conditions on the day you are doing the work. Also, just as when you are nitre blueing, excellent lighting over and around the tank is paramount because these temper colors will sometimes appear very quickly, but if the temperature rises too quickly, they may be lost within just a few degrees of perfection.

Fire blue. This process is nothing more than the heating of a prepared small part with the open flame of a torch until the desired straw, blue or purple color is reached, then the hot part is quickly quenched in water to stop the process and "hold" the color where it is. If you are anything like me, who seems to have the tendency of unthinkingly picking up parts that are too hot to handle; I would highly recommend that the user wear a pair of thin leather welder's gloves while performing this procedure. The only trick involved is that one has to work quickly while paying close attention to the changing colors as the part is played in the flame of the torch, so that you are able to move the part out of the flame and into the quench at exactly the right instant before the part gets too hot, and your colors are lost. If you do heat the part past the point where your colors are lost, fear not, it can be repeated. Simply cool the part, re-polish it like you did before and try it again.

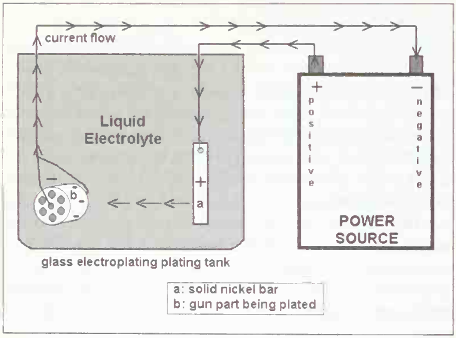
With care, this simple fire blue technique may be successfully used to color screw heads, pins and other such tiny small parts as were originally nitre blued. In fact, given much care and even more practice, you may develop this into a very useful process for coloring tiny parts. Once you have gotten expert with the method, try quenching the part in a light, synthetic motor oil like Mobil One© and then reheating and quenching several times; varying the quench can enable you to alter the final colors from the translucent blue achieved with a water quench to a deep blue-black achieved with an oil quench. Another method of fire blueing which can allow you to produce a more uniform heat from the torch and that you may find useful for oddly shaped parts is to use a flat sheet steel plate, like the one shown in the illustration which has had part of it bent to form a handle so it can be safely held with a pair of pliers and the top sides bent to form a small platform with two corners for the part to sit in. Place the prepared small part(s) that you want to color onto the plate and then apply the heat from the torch flame to the plate *from the bottom*. This method takes longer because you are heating up a larger surface area but this slower heating does offer you more control, and more time to view the colors. As you see the part turn to the exact color you want; quickly tilt the plate as you move the torch away, allowing your parts to spill into a water quench that is several (4-6) inches deep.

Plating

Plated handguns, especially the nickel plated variety were reasonably popular in the latter portion of the last century, not only did the shiny finish appeal to a large segment of the buying public but long before stainless steel was invented, plating offered the gun's owner the best protection from the elements that was available. Nickel and other metals such as silver, copper and gold

were affixed to the iron or steel of a firearm by the process called electro-plating a.k.a. electrolytic plating.

To explain the electro-plating process in as simple a manner as possible, let's assume we are going to plate a gun part with nickel. This gun part to be nickel plated is first stripped of all coatings, oxides and finishes (in other words abraded, sanded and polished down to bare, smooth metal and then made absolutely chemically clean) the prepared and clean gun part is attached to a copper wire which has had one end attached to the negative terminal of a storage battery. The gun part (which is now called the cathode) is suspended into a liquid solution called an electrolyte, made up of nickel and ammonium sulphate, boracic acid and water[2]; essentially this electrolyte is a super-saturate solution of pure nickel. Also suspended into the electrolyte is a bar of pure nickel hanging from another copper wire that has been attached to the positive terminal of the storage battery which will act as the anode. The electrical current then flows from the positive terminal of the battery through the bar of nickel (the anode), causing some of the nickel from the bar to be electro-chemically moved into the electrolyte. Since the electrolyte is already super-saturated with nickel, it can absorb no more of that metal unless it first gives up some of the nickel that it has already in solution, this the electrolyte does as the current flows through it and into the gun part (the cathode) on toward the negative terminal of the battery. As the electrical current flows from positive to negative, the electrolyte is giving up some of its nickel which is deposited uniformly over the entire external surface of the gun part (the cathode).



Where did electro-plating come from? Archaeological evidence tells us that the ancient Egyptians practiced crude forms of electroplating and that they knew how to make an electro-chemical battery indicating that at least the basic concepts have been with us for eons. Jewelers have known how to electroplate small items with precious metals for centuries. However, practical methods of electroplating on a large scale were not developed until after about 1812 when a German named J.P. Ritter[3] invented a crude wet-cell battery, which offered the first really dependable electricity-generating power source. Then in England in 1853 Michael Faraday perfected the theories of electro-magnetic induction, electro-statics and of the most importance to our story; electrolysis. Further improvements in electroplating occurred after 1860 when a much better wet-cell battery, known as a storage or secondary battery was developed by the Frenchman Gaston Plant´e[4] The works of Faraday and this latter inventor especially enabled more reliable storage batteries to be manufactured so these new sources of electricity were applied along with the scientific knowledge of electrolysis enabling the great strides in electro-plating which occurred during the 1850s and 1860s. After the American Civil War ended electro-plating grew to be a widespread practice in the jewelry and the firearms industries.

Nickel does not naturally adhere very well to iron but copper does, and nickel sticks to copper like glue. For this reason many early firearms were at first given a coat or "under-plate" of copper, which was then nickel plated. Not all gun makers used copper plate under the nickel thus it is fairly common to see some brands of handguns made from the 1850s though the 1880s with most of their plating "peeling" off in large sheets like an orange rind, often this is an indication of the lack of a copper under-plate; the iron has oxidized and its oxide is pushing the nickel plate off itself. Smith & Wesson apparently did some serious experimenting with electro-plating during the early 1870s; either they, or some unknown plating subcontractor successfully developed a process whereby nickel was applied directly to the iron without the copper under-plate. The author has no knowledge of what they did, nor of exactly when they did it, although I strongly suspect that S&W must have perfected some advanced formula for their electrolyte and/or some method of applying the battery voltage more uniformly than was possible with the normal methods then available. It would also seem they must have done this around the years from 1873 to perhaps 1875; I say this because the majority of their nickel plated weapons made after that time period are not under-plated and these seem to retain their nickel plating to a much higher degree than those made before them, including those that were copper under-plated.

In the standard electro-plating process a small, low-voltage current is naturally generated by electro-chemical means even before the battery or outside power source is attached. This electricity occurs by virtue of the two dissimilar metals (iron-vs-nickel) being immersed in the same electrolytic bath. Today due to the availability of some very sophisticated types of electrolytes, a process called electro-less plating has come into use in the arms industry. Even though it has been named *electro-less*, an electrolyte is still used in the pro-

cess and in fact a small electrical current actually does exist which is generated by an electro-chemical reaction as explained above, rather than from any separate or outside power source.

Removing finishes

The complete removal of the old finish is prerequisite to the metal preparation involved with refinishing any firearm. This is certainly true with plated weapons where every trace of the old plating must be removed or it will show up as a "lump" or dull area in the new plating or as a bright spot in the black if the weapon is going to be blued.

To remove old bluing or plating the first step is to get all the metal chemically clean. No matter how powerful the chemical may be that you are going to use to strip the old finish, if the chemical can't get through any oil or grease on the surface of the metal then it can't do its work, you will have to clean the metal first. That means the metal has to be not only spotless, but completely free of all old oils and greases. Older firearms that have had perhaps one hundred or more years to accumulate all sorts of crud build-up in all their nooks and crannies are best cleaned by using compound cleaning methods. You may develop your own favorite cleaning combination but it should be something along the lines of this; scrubbing the metal with a stiff bristled wire brush soaked in strong bore cleaning type solvent, followed by a bath in alcohol, then a hot soapy scrub-down and finally a good rinse with hot or better yet, boiling water.

Stripping blueing. Most blueing can be stripped with a mild acid solution. You can purchase blueing stripper ready-made from a gunsmith supply house or, you may make you own. Wash out a baby food jar with its lid, this will make a great container for the small amount of blueing strip solution you will make up, when you're done the remaining acid may simply be neutralized by pouring it in the baking soda solution we will talk about making below and then poured down the drain. I make my blue stripper from a muriatic acid (this is the "new" name for hydrochloric acid, you can buy it at any good building supply) base that I have diluted with clean cold water to the proportions of 20% acid to 80% water. Before we "make" anything, let's slow down a moment and think about exactly how and where we are going to use this solution.

You will be working with an acid, and even though it may be a comparatively mild acid solution it can still burn your skin and harm your eyes if even a drop of it lands on either. No, the acid won't do anything positive at all for your wife's furniture, stove nor her kitchen counter-top work area so I would advise you to rule those areas out right here. A good place to work with this can be a laundry basin or basement sink. In this way the acid drippings are contained in a sink where no harm can be done to the surrounding areas and where you have running water to rinse off both the weapon and yourself. Failing this, get yourself two of the large size Rubber-Maid plastic basins, the sort they sell for washing dishes in. One basin is left "dry" and will become your work area, the second is filled with clean, cold water and will be used for rinsing.

Now let's put some thought into eye protection and put on a pair of clear plastic safety glasses. Heavy chemical and acid proof rubber gloves are the next addition to your safety kit and finally, remember that acids are neutralized with bases. So mix up a fairly strong solution of baking soda with clean, warm tap water to the proportions of about 2-3 tablespoons baking soda to one cup warm water mixed in a small stainless mixing bowl. Keep this little insurance policy off to the side of your work area where it can be accessed quickly should you need it in an emergency. In this way if you do happen to get any acid in your eyes or on your skin, the effected area can be flushed liberally with this baking soda solution and then quickly rinsed with lots of clean cold water. We will also have other uses for this baking soda solution when you are all finished with the acid solution.

To use the blueing strip solution it is simply swabbed onto the clean blued steel. I like to heat the steel parts up just a bit by running the parts under warm, but not too hot water for a few moments, this always seems to greatly speed up the strip process. The best place to do this blue stripping work is at the bottom of your laundry sink (yes, please do put the strainer in so that no small parts roll down the drain or place a plastic basin into the sink and use that to work in) or plastic basin suggested above; place the gun part you are going to strip and the bottle of strip solution into the bottom of the basin. A wooden clothes pin, the hinged kind that you have to pinch to release makes a great tool for holding the swab. Now is the time to don your eye protection and rubber gloves. Clamp a clean cotton or cosmetic swab in the clothes pin jaws, wet the swab by dipping it in your acid solution and have at it. All you have to do is swab the solution liberally all over the surface areas of the part, the warmer the metal; the quicker the blue will strip. Some stubborn areas may require liberal rubbing with the wet swab and even continued wettings with the acid solution in order to remove all traces of the old blue. Older S&W blueing was often Carbonna blue, this is chemical resistant (not proof) blueing, especially when its 75 years old and these may take a few moments of rubbing to break down the blue. Just keep applying fresh solution until the blueing gradually fades off.

If as I recommended earlier, you have done a thoroughly good job of pre-cleaning the metal you will be able to strip off every last bit of the old blue with your solution so that you are left with nothing but plain grey steel. When you have finished the strip process, immedi-

ately give the part (s) a bath in your baking soda and water solution that you made up earlier, allowing them to soak there to neutralize any acids remaining on the parts for about five minutes before rinsing all parts thoroughly in clean, running cold water. The last step, as suggested above is to neutralize that last remaining bit of acid solution that is left in your baby food jar. This can be done in the bottom of your sink or basin by slowing pouring it into the baking soda solution, this will cause the baking soda solution to foam and its temperature will rise somewhat. When all the foaming has stopped, the remaining inert liquid is simply diluted with lots of cold tap water as it is flushed down the drain.

Stripping nickel:

The processes used to strip nickel were at one time limited to either an expensive reverse electrolysis process or to an inexpensive but terrible smelling, and very poisonous ammonia compound which had to be used boiling hot, further compounding its awful stench. Earlier on I described how the nickel is plated onto the steel using electro-chemical means where the electricity is made to flow from positive to negative passing through a pure nickel anode into an electrolytic nickel solution, then on to be deposited on the surfaces of the gun which forms the cathode. The reverse electrolysis method works in exactly the way what it sounds like it might, the process and current direction is reversed, causing the nickel to move off the gun by induction, into a different kind of electrolyte, thence onto an iron cathode. Odoriferous nickel stripping methods working at boiling hot temperatures actually dissolve the nickel itself. It should be mentioned again that no method of stripping nickel plate will be very effective if as suggested earlier, the parts to be stripped have not been thoroughly cleaned of all grease and oils beforehand.

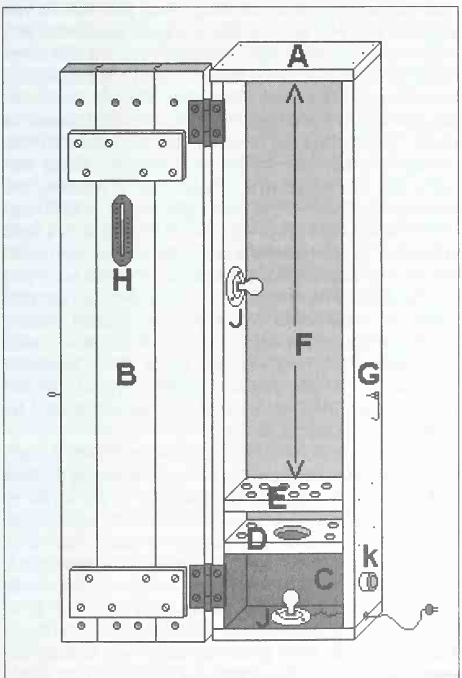
Brownell's Inc. has a variation of the *stinky stripper* as well as a much less expensive method of stripping nickel by reverse electrolysis with a product called "Super-Strip". More recently this company has been offering a newer method in the form of a non-electrical, "cold strip" chemical as a two-part solution that they appropriately call "Room Temperature Nickel Stripper". Over time I have used all three types and methods of nickel strip in my shop and can highly recommend the very thorough "Super-Strip" method of reverse electrolysis for the larger, busy gunsmith shop who may be doing a lot of nickel stripping. For the small shop or the amateur who may only strip nickel occasionally, the "Super Strip" may be a bit much in terms of expense and trouble since it requires a six volt car or truck battery, a power source, a voltmeter as well as the chemicals, tanks and sundry equipment. Also, since the "Super Strip" is an *active electrolysis* process, its important that someone keep an eye on the strip process to make sure that no damage is done to the steel parts during the strip.

For the small gun shop operation or the amateur a more sensible choice would be the Brownell's "Room Temperature Nickel Stripper", while this is a slower nickel stripping process, it is also by far the easiest and least expensive product to use. Brownell's says the room-temperature product will usually strip nickel in from thirty minutes to four hours and from my experience that is about right, although I've had some stubborn parts that required six hours or more to be completely stripped of nickel. The product does give off a mild ammonia smell and ventilation is recommended; it requires little above room-temperature heat and no agitation nor electricity to function, a plastic or steel container can be used and it can also be saved to be used over again several times. My choice for a nickel stripping tank with the Brownell's room-temperature chemical is a large enameled steel pot with a lid. I place the pot with the chemicals on a small Coleman propane camp stove, in this way I can easily raise the temperature of the chemical and maintain it at a level of no hotter than 80 to 85 degrees Fahrenheit, a temperature range where it seems to strip the nickel more completely and at a slightly faster rate than it will at 68 to 72 degrees or what are considered normal room temperatures. After parts have been in the room temperature strip solution for about an hour you may notice they have become coated a greenish-brown scum, I find it speeds up the stripping process if this scum is removed. If the scum is apparent, take the parts from the chemicals and rinse them in warm water, then scrub them down in warm water with four-O steel wool until all the greenish coloration is gone, re-rinse in warm water and place them back in the strip pot.

Rust blueing methods: Rust blue, as we mentioned is the most durable and one of the loveliest of gun metal finishes, it is also one that requires little in the way of shop equipment. What will you need? The rust blue process is relatively simple and its equipment modest, requiring a tank large enough to hold the largest item you want to blue to hold boiling water along with a heat source, perhaps a damp-box (see below), a method of holding the parts once they have been prepared for blueing and a means to card off the fuzzies (excess oxide) after boiling. In a nutshell: First the steel is prepped, then cleaned and from that point on it cannot be touched by human hands lest the new finish be spoiled by the oils from your hands, so holding devises would be fashioned from wire or wooden doweling. Then an acid solution is applied to the prepared, cleaned steel. The acid coated steel is next allowed to rust until a red-orange "fuzzy" coating appears all over its surfaces (the russet-brown, ferric oxide is formed) for a given time, say 12 hours and then the part it is boiled in clean water for several minutes until its surface turns a "fuzzy" black (the ferric oxide is converted into ferro-ferric oxide, a.k.a.: black magnetic oxide.) After removing the part from the boiling water and allowing it to dry and cool, the part is "carded"; that is rubbed with either 4-0

steel wool or with a scratch brush (an ultra-fine bristle rotating wire brush) to remove the excess oxide or "fuzzies" we mentioned before. The process of coating with acid, rusting, boiling and carding is repeated until you are satisfied that the desired deep black colors have been achieved, this usually takes five to six applications although with certain steels it might take as many as eight. Let's get started.

A damp-box. Depending on the blueing solution you are using and the degree of latent humidity in the area where you live, you may have need of a damp-box to facilitate the controlled rust process. Since I know of no commercial manufacturers you will have to make your own. The illustration here shows how a suggested "damp-box" might be constructed from dry tongue and grooved pine boards, although exterior grade 3/4" plywood could certainly be used instead of pine. The exact dimensions of your damp-box will have to be determined based on your own needs, although a good internal depth and width might be about 14 inches by 14 inches with a height over the top-shelf (at "F") of about 52 inches. The height may be a more important consideration if you were going to be blueing or browning extremely long gun barrels like those used on Kentucky/Pennsylvania rifles; your damp box could accommodate these by increasing the height *over the top-shelf* to about 60 inches or even more. You can imagine what goes on inside the damp-box once the door is shut: the burning high-wattage light bulb in the insulated lower chamber gradually heats mainspring the water in the pan on the shelf above, causing moisture from the water to rise with the heat through the vent holes in the top shelf and into the upper area of the box. The heat is supplemented by a low-wattage light bulb mounted in this upper compartment which also supplies a source of working light, if all goes well we have a nearly perfectly controlled atmosphere that will promote our rusting process. Here is how we would like to see this box work:



Placing a small porcelain light fixture (J) at the inside of the damp-box base at "C" with a bulb from 100 to 150 watts will provide your small heat source, attach the electrical wiring for this fixture to a dimmer switch (K) with a plug that is long enough to reach through the side or rear panel of the box to a nearby outlet. The dimmer switch enables you to control the brightness, hence the temperature in this lower compartment. I like to line all the walls, floor and ceiling the inside of this lower compartment and that portion of the door which covers it with "aluminum foil-backed foam insulation, not only to help hold the heat, but to provide some measure of fire resistence for this lower chamber. Just above the top of this light bulb will be your moisture shelf ("D") which should be equipped with a large hole at its center; into which a small stainless bowl will be placed which will contain the water that will supply the moisture for the damp-box.

This moisture shelf may be somewhat adjustable for height; what you want to end up with is for the bottom of the stainless bowl to be about 2 to 3 inches above the top of the light bulb when the bowl is placed into its hole in the moisture shelf. As mentioned above the dimmer switch controls the lower light bulb and will allow you to regulate the temperature in the lower compartment, hence of the water above it, but making this shelf adjustable for height allows you to move the water bowl closer or farther from the bulb should more "fine tuning" be required. Above the moisture shelf is the parts-rusting shelf ("E") which should have several 3/4 inch diameter holes drilled through its center to permit the warm moisture from the water in the bowl to freely rise into the upper area ("F") of the box where the parts to be rusted will be. Think about providing the top-inside sides of the box with several brass (non-rusting) screw-eyes that you can use for suspending parts from wires as well as a removable wooden shelf or two that oddly shaped parts will sit on.

Inside the top compartment, about mid-way up, you will mount another porcelain light fixture, this one is wired independently of the first and it will hold a 25 to 40 watt bulb. The second bulb is to provide heat and illumination to the top compartment. The door should be solid wood or of the same construction as the box and set on at least two butt hinges so that when it is closed it seals the whole front edge of the box. This

does not need to be an airtight closure so weatherstrip or sealer will not be required. A simple hook and eye closure will work fine to hold the door shut and you should drill four- to six-inch holes through the door, about 2 inches from its top to give the interior a very small amount of ventilation. A small indoor-outdoor thermometer (H) can be mounted right into the door in such a way so it can be read without opening the door.

Some experimentation will be necessary to make the damp-box perform as you want it to, and this will need to be done before you actually start to use the box. Fill your bowl about half-full of warm tap water, place a small meat thermometer into the water pan, turn on the damp-box light and close the door without any parts in the upper chamber. Come back to the box and check the temperature once about every half-hour. The ideal situation will be for the top chamber of the box to reach 90 to 95 degrees Fahrenheit and hold that approximate temperature, while the water temperature is ideally maintained at 140 to 160 degrees Fahrenheit. When this combination is met, the damp-box should be holding about 80-85% humidity. You may get a bit fancier by the addition of a hygrometer to the upper chamber, (an instrument that measures atmospheric humidity) although I have managed to avoid using one and after "fine tuning" have always arrived at a workable humidity level.

Metal preparation: We prepare the metal for rust blueing almost as we would for any refinishing operation. The surface is repaired, restored to factory specifications (to the way it looked when it left the factory, and this may sometimes entail having markings re-cut by an engraver) and hand polished. Machines can be used, however years ago I settled on doing this all by hand. Hold on man, I know you are going to say "but. . .that will take forever!", *but. . .it doesn't have to take forever.* In fact once you get the hang of it, hand prep is not nearly as slow as it sounds, and in the end I think you will agree that the 19th century factory-looking results will be well worth the effort. Barring any really rough areas which may require draw filing to remove severe rust pitting or other damages, the metal is surfaced by using progressively finer abrasive papers, these are usually backed with small blocks of hardwood (for flat surfaces) or large rubber erasers (for the irregular, rounded and curved surfaces). Larger convex rounded areas can be *shoe-shine* polished. The hardest guns to "bring back to normal" are firearms that have previously been "redone" and were in effect "done-in" in the process by some individual who aggressively, over-polished the metal, using abrasive on loose polishing wheels. Weapons like this, that have had their markings obliterated and their sharp corners and angles broken are by far the most difficult to bring back to factory specification; in fact I have seen some rusty, dug-up relics that had not ever been refinished that were much easier to restore than some of the badly refinished ones we have worked so hard to restore. Unfortunately, some of those latter guns will never be worth the time and money it would take to bring them back.

For abrasives I use regular production grade sandpaper down to #220 grit, which I switch off to the wet-or-dry variety where I use "wet" with either WD-40 or white kerosene as my liquid medium. Wet-or-dry paper cuts quicker and much more uniformly when it is used *wet*, it also lasts far longer. As to abrasive paper brands, in my experience there is really only one brand; *3-M production paper.* Other brands will work but none of them have ever lasted even half as long nor offered me the sheet-to-sheet consistency the 3-M brand has. Take great care during your preparation work to keep all lettering, markings, corners and edges sharp and square and finish up the work from each grit of abrasive paper with your polishing lines going in the same direction before moving to the next finer grit abrasive. Stop when you have achieved a bright consistent polish at no finer than #400 grit, personally I prefer an extra-well done #320 finish. The reasoning behind this is that the acid solutions you will be using to "start" the rust blue process need a fairly coarse surface to "dig" into. If you have polished any finer than about #400, you will often end up with splotchy, spotty blue work.

Plugs and handles: Satisfied with your metal prep work so far? We will assume the part is now prepared so that it is in what we call the "white" state, the pre-finish state the next step is its cleaning. Only now, before you clean it, you will have to find a way to handle the part once it has been thoroughly cleaned so that it will never again be touched by human hands until after the whole process has been completed. Gun barrels should be plugged tightly from both ends with softwood dowels or plugs. These plugs are to insure that the bore won't be damaged in any way by the next process; which will artificially and aggressively create rust. Try coating the inside of the bore with a very light coat of WD-40 and then coat the outsides of each wooden plug with a light coating of yellow woodworker's glue just before installation. Any excess glue that squeezes out can be wiped off clean once the plugs have been tightly driven into each end of the barrel. When you are finished blueing and the plugs are removed, this type of glue won't stick very well to oily steel and any traces of the hardened glue can be simply *plunked* (lightly scraped) off the insides of the barrel with no harm done to the bore by using a small, stiff dental pick.

Often these wood dowel/plugs may simply be left long enough to provide you a convenient handle on each end of the barrel. Sometimes there are empty screw or pin holes that pass through the receiver or a barrel sight base where you can pass strands of black iron wire which can be used to handle the piece. Failing either, a strand of wire can be wrapped around a screw shank and the screw inserted into its hole and tightened. How you make the handle is up to you, all guns are different and so you will have to devise some way to hold the part(s) that is both secure and that will keep your hands

away from the bare metal at all times for the next several days that the remainder of the operation will take and through some possibly rough handling.

Get it clean: Alright, now that you have the critical handling situation solved, scrub the entire part down with a soft cloth soaked in rubbing alcohol and then take it back to the kitchen sink (is the wife looking?. . . shhhhh) and give the prepared part a bath in a solution of hot water with plenty of dish-washing liquid detergent, (not automatic dishwasher detergent, use the kind intended for hand washing) if there is a preference; blue Dawn seems to work best as a grease and oil cutter. Scrub the part thoroughly with a soft clean cloth, using a small toothbrush to get into those hard to reach areas. The entire part has to be absolutely, positively squeaky clean. In a nutshell, if it ain't clean, the process won't work! Now rinse the part just as thoroughly with hotter-than-you-can-stand clear tap water for at least sixty seconds, at the end quickly grab it up with paper toweling, using great care never to touch the bare metal with your bare hands and pat the whole thing dry. Get the part back to your shop or blueing area quickly and hang it or mount it where you can work on it without it moving around.

Be safe!: You will be applying the rust blueing solution next. From here on everything you hold in your hand has the potential to have strong acid on it, and even a drop of that acid can be disastrously damaging to your skin, finger-nails, and eyes. The recommended dress code is a long sleeved flannel shirt with the collar closed, a rubber shop apron, acid proof rubber gloves and eye protection consisting of safety glasses at least; with my preference going to a full face shield. At any time while you are applying the blueing solution should you get an itchy feeling anywhere on your exposed skin, it is probably an acid droplet that is beginning to burn your skin. Stop right there! Drop what you are doing and immediately go flush the itchy area with cold, clean water and after that wash with soap and water. Want something faster? We already know that acids are neutralized by bases, try keeping a small pan of baking soda and warm water a few feet away from the blueing area while you are applying blueing solutions in the event of just such an emergency. Acid can be so unforgiving, in a real emergency this baking soda solution could save an eye.

The solution: I like to use a wooden clothespin, the two piece spring loaded kind, to hold a small cosmetic swab (the synthetic fiber, rather than pure cotton seems to apply the acid more uniformly) between its teeth. The swab is held over the open bottle's mouth while the bottle is tipped once, move the swab just a bit to the side and tip the bottle against it once more. Now dab the damp swab once against a clean sheet of paper toweling, just to force the solution into the fibers and to help get rid of any loose droplets. My personal choice for store-bought rust blueing chemicals is a product called "Pilkington Classic American Rust Blue". This is readily available from Brownell's Inc., comes in a conveniently sized 4-ounce bottle and produces excellent results both with or without a damp-box. Slightly more difficult to use is Laurel Mountain Forge's *Barrel Brown & Degreaser*. This tried and true product requires the use of a damp box, but it also produces rust quite rapidly and offers the benefit of being among the finest, most dependable rust browning or blueing formulae ever developed.

Applying the blueing solution: This next is the most critical portion of the entire operation; the application of the first coat of solution to produce the rust. If you don't get this right, all successive coats will suffer and the job may never look good. Putting the shoe on the other foot, if you do get this first coat right you can almost bungle the successive coats and the job will still come out fine. To this end, it can help a great deal if the pre-cleaned part is warm before you apply the solution, so if the part has been allowed to cool after cleaning, I suggest warming the part in your oven to about 160-180 degrees Fahrenheit before starting this. Immediately, while the cleaned part is still warm, apply the rust blueing solution with your swab in long, un-broken, overlapping passes; always going in the same direction. Start on one end and don't stop till you have reached the other end, always beginning at the same end of the part. For instance, start the swab stroke at the muzzle, and end at the breech each time. Keep a small, long handled bench swab handy which has been dampened with the blueing solution so you can apply solution to any and all hard-to-reach spots. When you have the part completely covered, examine the coating you have just applied; it should appear to have all the surface areas covered; if not, quickly re-coat the entire part, using a new swab with clean blueing solution. Let the part hang for an hour and then re-coat it, always using a new cosmetic swab and new solution. Hang the part(s) either in a damp-box or in a place where they will not be disturbed for about the next three to twelve hours (keep a close eye on how the rust is progressing, the exact length of time will depend on the kind of blueing solution you used, and the amount of humidity in the atmosphere.)

The "fuzz" is the key: You will know when you are at the end of the hanging/rusting period when you see a red-orange or, believe it or not, even a green colored "fuzz" all over the part. The coating should appear uniform all over, not so much in color but uniform as to the consistency and thickness or density of the "fuzz"; if it doesn't look uniform keep your eye on those areas that seem to lack consistency, those areas might mean that you have to start over. Once that *even-fuzz* situation is reached, and has remained that way for at least an hour, then proceed to the next step. If you should see any areas that appear wet or glossy orange, this may be an indication of far too much humidity or that you forgot and have left the part rusting too long; in any case proceed to the next step quickly. Prepare a tank that is large enough to hold the biggest part, full of clean and rapidly boiling water. The part(s) is gently placed into and

L-R; Formula 44/40 initially gives the darkest color but is not as durable as Brownell's Oxpho-Blue which comes in either a liquid or a creme formula. Brownell's Dicropan is widely used for touching up double shotgun barrels, is fairly durable but light in color. Author photo.

under the boiling water where it is allowed to be at a rolling boil for at least five full minutes. After this time the part is removed from the water, drained and allowed to air dry and to cool until it is nearly room temperature. You will have noticed when you removed the part from the boiling water that the "fuzzy rust" has now turned into "fuzzy black stuff". Then the part is picked up by its handles and the "fuzzy black stuff" is carded off using either a soft, rotating scratch wheel or 4-0 steel wool until you are left with a shiny, just beginning to blacken metal surface. If you have had the part in too high humidity or if you have left it rusting too long those areas that formerly appeared a glossy orange or "wet" before the part was boiled will now be pitted even though the metal is starting to turn black. If that is the case you will have no choice but to return to the metal preparation step where you will remove any new pitting and the metal is prepared anew for the blueing process which you will have to start all over again.

Once again: The next steps of the blueing process will be simple repetition; warm the part in your oven to 200 degrees, swab the part clean with rubbing alcohol, swab on another application of rust blueing solution and hang the part for another 12 hours. After you have boiled and carded the part for the second time, check the surfaces carefully to be sure you are developing a consistent and unbroken coating of black color. If you are seeing splotchy areas that are not "taking" the blue, stop here and resurface the part again; in other words re-prepare it for blueing and start over, those splotchy areas are simply spots that didn't get as clean as they should have, they will never color properly.

Let's assume the color is going fine after the second application; you have gotten an even and consistent coating of rust developing externally over the entire part. All that you need to do is keep repeating the swab, rust, boil, card, clean, heat, swab, rust and etc. over again and do this as many times as you feel is required until your desired color is achieved. Exactly when this will happen will vary with different steels and atmospheric conditions but you can usually count on seeing the desired shade of black within from four to six of the aforementioned coating procedures, but certainly after no more than eight you should have a jet black, and absolutely beautiful silky rust blue finish that any professional would be proud of. After the last carding, clean the surface with alcohol again. I like to let the finally blued part(s) set in the air just as they are without oiling for about 48 hours and after that wipe on a light coating of a good, synthetic gun oil.

Lastly, if it was a barrel you just blued, pull those wooden plugs out of the bore and scrub it well to remove any lingering traces of rust with a stiff bronze brush soaked in WD-40 or kerosene. Even though you have had (or should have had) the both ends of the bore well plugged, some of the moisture from all that boiling and from sitting in high humidity may have permeated through to the bore. Since the whole process takes at most, a few days there should not be any damage to the rifling, only a light coating of mild rust which can be scrubbed out.

Cold blue and touch up blue: other methods. Touch up blueing, in some circles folks call this cold blue. This is not to be confused with the slow rust blue process, which is also sometimes referred to as cold blue. As you will find, there are many products available which claim to darken "as original blueing" or that they will match original factory blue right out of the bottle, but I have come to the unpopular conclusion that the goose that laid that golden (or in this case, black) egg does not live in or anywhere near a little bottle of cold blue solution. Yes, these cold blue products have their place for darkening small, protected areas where there is a lot of shadow, but if you try to match the color of the original blue in a place that has worn bright but is otherwise surrounded by good original color, you are likely to be very disappointed with the resulting colors: They don't match, won't match and they aren't going to match no matter how hard you rub or how many applications you apply.

The makers all tell me the same sort of things they are telling you, "Try this, clean that first, rub this way with that," *Yeah, yeah, okay*, but I really did try all that and the color still isn't right. After being in this business for more than twenty years I think we must have tried all the brands of touch-up blue, I might have missed one but I don't think so. All of them seem to have about the same composition, although to be fair some will color steel darker than others; *at least at first* and for as long as you haven't handled it. Still, these products have their place in the gun shop and there are times when a spot of any darker color is heaven-sent. Of all the touch-up blueing solutions we have tried, Brownell's Oxpho-Blue has shown itself as the most durable although it does have a tendency to be a bit light in color. *Formula 44/40* is not quite so durable but from the first coat its usually darker than any other cold blue.

On older guns from the 19th or early 20th century there are other hot/cold methods that can work pretty well and still present a professional looking touch-up. These methods don't require much in the way of special equipment or expensive tooling and what I am about to describe is what used to be known as *express* or *fast rust blue*. This can often be applied to selected worn areas, and may come very close to what is left of the original colors. Not that it will not match every gun's original color, because it won't always. A good idea would be to blue a piece of test steel first, or better yet, a test area on your gun in some hidden area, perhaps under a grip and then compare it under a good incandescent light to an area of good original finish. If after 2-3 applications the color on the test piece doesn't begin to look right, you will now know not to bother trying to touch up this gun using this method. For instance, this method will not match either nitre or most charcoal blueing which is transparent, since the rust blue will produce a thick opaque oxide. On the other hand, this approach can be used to very nearly duplicate a slow rust blue finish and even some charcoal blue finishes after they have become worn, and some other types of blued finishes on older guns that have aged considerably.

Here is how this process works. As with any other preparation before finishing work you must clean the disassembled gun with solvents, and then wash it in hot soapy water until it is clean . . . and I mean clean. Scrub it well in hot soapy water with a soft brush, rinse it with hot water, and then wash it down with alcohol. Now the cleaned gun, or portion thereof, is placed into a pan of boiling water for five minutes. Beforehand, make certain that you have a good method of holding the boiling hot part, you don't want to burn yourself, and just as importantly, you should never touch the cleaned part with your hands. Any of the fatty acid or oily deposits from human hands can quickly spoil the finish you are attempting to create. Remove the piece from the boiling water and immediately swab the affected area with a cotton swab that you have wetted with Birchwood Casey's Plum Brown (you can use a cotton ball held in the jaws of a clothespin very effectively for this operation.) Once the area of the part is fully saturated with Plum Brown, place your part back into the boiling water for another five minutes. After the time has elapsed once again remove your piece from the water and card it (scrub it) with a *clean* four-0 steel wood pad to remove the fuzzy coating from the Plum Brown solution. (Note: New steel wool is wetted with oil in order to prevent it from rusting before you use it; steel wool may be made sanitary for our purposes by washing it in rubbing alcohol and allowing it to air dry overnight, however be sure you only clean enough of the steel wool for your immediate requirements because once you have it washed clean of that preservative oil, it will rust very quickly in the air.)

After rubbing the fuzzy coating off the part with steel wool, clean the part once again with alcohol, place it back into the boiling water and repeat the entire above process as many times as required until the area of the part is coming out with a color that is close to the original. In many cases it will only take two or three applications but some steels may require four, five or even six coatings. The very durable color that you will produce by this method is not blue, it is in reality a very rich and deep opaque-black, and it is a high quality finish that will wear very well. After the final rubbing with steel wool, boil the part just one last time for a few minutes then, after you remove it from the boiling water, give it a coating of good quality gun oil while it is still hot.

Every few years this product seems to disappear and then reappear on the market. Original formula Belgian Blue is once again readily available from Brownell's Inc., Author photo.

Firearms Restoration

What is it? And: Is it right, or wrong?

Restoration is a word that seems to be bandied about more and more these days, but with the likelihood that fewer people rather than more, actually understand what they mean to say when they use it. This term *"restoration"* can have various meanings, with each one being dependant upon the individual circumstances and the restored article, but dependant most of all on *who it is* that is doing the telling. Even the trusty dictionary

refuses to be pinned down to one single, good explanation of the word *restoration*, so it might just be worthwhile to take a few moments to try and sort out this word as it specifically applies to antique firearms. Perhaps if we really try, we can find some useful clarification and apply it to this often misunderstood little word that has on occasion proved itself a bane to antique arms collectors and dealers alike.

Some definition: *What in the world is a firearms restoration?* Over many years of handling antique arms it became necessary along the way to develop some practical answers to this question. Almost all the time I have found that it will normally come down to one of the following three definitions which we will normally use to define the word *restoration.*

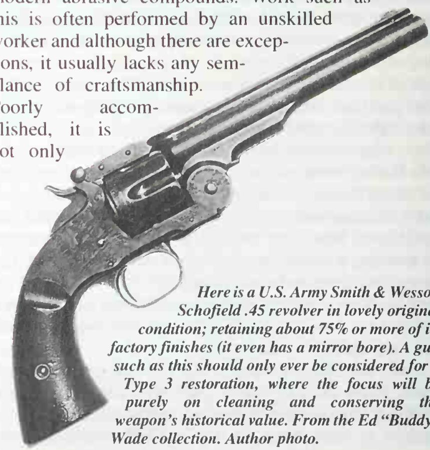
1) A *"full" or complete restoration.* (a.k.a.; a museum-quality restoration, a.k.a.; "make my gun look and work as new".) Any work of this extent would necessarily involve the craftsman going over everything in, on, and around the weapon, no crevice would be left untouched. *This would entail a complete renewal of the gun, both mechanically and in terms of the exterior finishes and original markings*, including areas of the weapon that are not readily seen during the casual examination as well as the exact duplication of factory finishes, which may well be long obsolete. In many instances this will mean actually re-manufacturing many areas of the weapon, especially when there are extensive rust damages and where new replacement parts are not available. Any job this extensive may easily have costs that run into the thousands of dollars.

2) *A "factory type" restoration.* (a.k.a.; "make the gun look and work like the factory would have if it were sent back to them in the 1930's, or the 1880's, etc.") A job like this would entail repairing all the gun's mechanical areas so that the firearm is made fully functional, and on the metal it would involve re-surfacing and restoring the external factory lines, original (often obsolete) finishes, and sometimes the markings. This work would normally be done with an eye toward the preservation of any factory markings present, even when that means leaving some of the deeper rust damages. The wood may also be given a factory-like refinish, also with an eye to preserving any markings, and the fit of wood to metal must be maintained. Some old scars in the wood, and/or small pitted areas in the metal may still be present, although the gun should look like the factory had done the work. A job like this will usually cost in the area of several hundred to a thousand or so dollars. This is the most commonly encountered type of restoration. Today the gunsmith ends up with restoration jobs like this because, for the most part, the gun factories either no longer exist, or they are no longer willing or able to perform such work on their obsolete models.

3) *An historical restoration*, a.k.a.: *purely preservation.* During this third definition of arms restoration, the weapon would be carefully disassembled and thoroughly cleaned. Any mechanical problems would be corrected in order to bring the gun back to a fully functional, original mechanical state. External wood or metal repairs may be made but only with a view to make the weapon complete, and functional as original. No refinishing work would be done, excepting perhaps to preserve some specific damaged area but with the proviso that any such work would be made to match as closely as possible, the guns' present condition. This historical restoration process is done solely to *preserve* the weapon historically, never to make anything look new. Speaking of values, a firearm's *historical value* may, or may not have anything to do with its *monetary value.* For instance, great-grandad's well-worn old Model 1892 Winchester rifle may only have a listed book value of $300, however just the fact that it has been in the same family for four or five generations could place this gun in the category of being priceless to its present family-member owner.

And not? Alright, now we know that we have some clear idea what the definitions for a restoration are; how about what is not a restoration? Restoration is *not* a re-blue or re-nickel on a Civil War vintage weapon using modern methods along with a high luster polish that is achieved by the aggressive use of buffing wheels with modern abrasive compounds. Work such as this is often performed by an unskilled worker and although there are exceptions, it usually lacks any semblance of craftsmanship. Poorly accomplished, it is not only

A good example of a Type 2 restoration, this Liberty Antique Gunworks restored Winchester Model 1892 exhibits replacement walnut stocks, bone and charcoal process color case hardening and nitre blued screws. Author collection and photo.



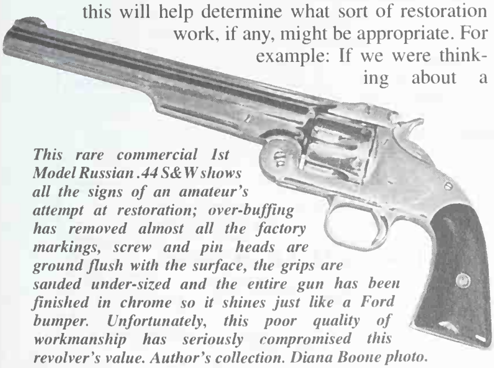
Here is a U.S. Army Smith & Wesson Schofield .45 revolver in lovely original condition; retaining about 75% or more of its factory finishes (it even has a mirror bore). A gun such as this should only ever be considered for a Type 3 restoration, where the focus will be purely on cleaning and conserving the weapon's historical value. From the Ed "Buddy" Wade collection. Author photo.

completely inappropriate for the older firearm but can permanently change the physical shape and appearance of the arm, ruining sharp factory corners and edges while obliterating desirable factory markings. Wood stocks or grips would never be sanded while they were off the gun in areas where the wood fits together with the metal; such over-sanding causes the edges of the wood to be lower than the metal, thereby leaving unsightly, unprofessional looking gaps and effectively ruining the wood. Nor would it be called restoration to alter the weapon from standard by changing caliber, shortening the barrel, milling metal off the receiver or frame in order to fit "special" target sights, or altering hammers, triggers, grips or stocks to suit some unique personal preference.

Is restoration right or wrong? Here is a truly important and valid question, but after reading the definitions of the word, one that doesn't seem to have a single, easy answer. Restoration of some sort may be quite right for some weapons, and yet totally inappropriate for others. I suggest that it is first necessary to determine *what* you have in the way of a firearm before trying to apply one or more of the above definitions for restoration. In other words, does your weapon qualify for restoration work, and if you think it does then what kind of restoration work would be proper? We will have to keep asking questions in order to find the correct answer to fit your individual firearm.

How will restoration work affect the value of an old gun? Again, any answer would be given in the subjective sense because value, like beauty is often in the eye of the beholder, so in the end the intrinsic value of the gun before restoration will determine your answer. Should the gun be deemed as fairly rare but it has sunken into deplorable condition, a first class restoration ought to increase its value. Bear in mind that much of any collectable's value is based on its rarity and originality, then its condition, thus any attempt at restoration work, if it were poorly done like the work described earlier may completely destroy the value of an antique firearm.

How rare is the weapon in question? The answer to this will help determine what sort of restoration work, if any, might be appropriate. For example: If we were thinking about a one-hundred and twenty-five-year-old firearm which was one of a production run of only 1,000 guns, so that perhaps 80 known examples of these weapons still existed today in collections and museums, then any work performed on a weapon like this should fit within our third definition of restoration. This means all restoration efforts are made with the intent toward *preservation* from further deterioration, and of course, to rehabilitate and maintain the weapon's original functionality. A firearm such as this would certainly have important historical as well as monetary collector value as it is, so any refinishing work would be totally incorrect on a piece such as this.



This rare commercial 1st Model Russian .44 S&W shows all the signs of an amateur's attempt at restoration; over-buffing has removed almost all the factory markings, screw and pin heads are ground flush with the surface, the grips are sanded under-sized and the entire gun has been finished in chrome so it shines just like a Ford bumper. Unfortunately, this poor quality of workmanship has seriously compromised this revolver's value. Author's collection. Diana Boone photo.

On the other hand, if we are speaking of a *regular production* gun from the same era, one of many that was manufactured in quantities of thousands or even hundreds of thousands we could have a much different answer. In such a case it may be perfectly alright to properly repair and refinish the weapon so that it meets with an original *factory standard* if the owner so chooses. Well executed work should not harm the weapon's value and furthermore, if we assume that the piece was probably in awful condition to start with, the work should actually improve its monetary value, as well as leaving the owner with a great looking and functional example of this type of weapon that may now be enjoyed.

If you were to consider that same situation, with this identical category of gun but one that instead retained 70% to 90% or more of its original factory finishes, then the advice would have to change. Aside from any repairs that might be required in order to restore proper function and perhaps a professional cleaning, any old firearm with this much factory finish should be left strictly alone. Some might chose to disagree with me on this, but I have never believed there was anything to be ashamed of about having a bit of "good, honest wear and tear" on an old gun. In yet another scenario: Suppose for a moment that you have proof that a very important historical figure had owned this gun, and further, it was learned that it was "he" who had put the wear on the gun. What do you think ... should this piece be refinished? The intrinsic value of any such a weapon would depend strongly upon exactly "who" that important previous owner was, but as a rule of thumb, any firearm falling within this category should never be refinished or altered in any way, it should be preserved as is.

We can see that restoration does not automatically mean that the weapon will get refinished to a bright and shiny new condition and in fact, restoration work might, or might not involve any refinishing. Your true definition of restoration will always depend on the individual firearm; on the arm's relative rarity, as well as its present condition but most of all, the final choice of both definition and of the weapon's fate, will be made by the weapon's owner. From a historical standpoint, firearms restoration in whatever form you chose should

be viewed first and foremost as the preservation of a piece of history, as such; any form of antique restoration ought to be done correctly, or not at all.

The right color, where?

What finishes and colors are correct on these *guns of the old west?* Applying the correct finish to an older firearm is so important, not only to preserve the original "look" but to try and conserve it's value. Knowing what finish is correct on any given weapon may also aid you in determining whether or not a weapon has been refinished outside of the factory. In truth, rather than one single type of finish, many of the guns built in the 19th and early 20th centuries used various combinations of the finishes we have spoken of elsewhere. For instance with Colt Single Action Army revolvers, the so-called *blued* revolver would have had a blued barrel, grip straps, ejector assembly and cylinder along with a contrasting color case-hardened frame, loading gate and hammer; a combination of colors that makes for a particularly striking appearance. On the other side of the coin, a *nickel-plated* Colt Single Action Army would be proper if it were completely nickel-plated. Not all of these older firearms used the same combinations of finishes though. A *blued* S&W Model Number 3 revolver would indeed have had blued major component parts; the barrel, cylinder and lock frame, but they would have a trigger-guard, hammer and barrel catch that were color case-hardened, sporting nitre blued pins and screws. This same revolver offered in the factory *nickel-plated* version would have still retained the same color case hardened trigger-guard, hammer and barrel catch that was used on the blued counterpart, even while its major parts were nickel-plated.

Some early Winchester lever actions might use color case-hardening on the receiver, finger lever, hammer, buttplate and forearm cap along with a rust blued barrel and magazine tube, with nitre blued spring cover and small parts. For a time Winchester referred to these color case-hardened receivers as their "rainbow colors" and the combination of all these different colors against the walnut stocks made an even more attractive showing on a rifle-sized weapon than it did on a handgun. Into the early part of the twentieth century, even after Winchester had pretty much discontinued color hardening receivers, the practice of color case-hardening the finger lever, hammer, buttplate and forearm cap on many lever guns continued along with a receiver which may have been blued by one of several methods, and a blued, barrel and magazine tube.

Until fairly recently, these beautiful combinations of contrasting color finishes had largely faded into history. For economic reasons by the 1940s almost everyone had discontinued the use of color case-hardening excepting a few of the shotgun makers, and S&W who still retains this finish on its hammers and triggers. There are no absolute *hard and fast* rules to this, but the charts below may help explain what is generally considered to be "normal" on some of these older weapons. In the world we live in today we tend to view all commodities and most services as being "standardized". This was not the case a hundred years ago when most of the gun factories would happily supply just about any sort of un-cataloged option the customer fancied for only a few dollars more than the cataloged price. Given this, you may rest assured that you will occasionally run into factory-made weapons that differ from the "normal" finish combinations shown here, and at least some of those will be factory original differences. The very best way for you to know for certain whether or not some aspect of an older firearm is factory original or a spurious fake is to educate yourself thoroughly beforehand as to exactly what "original" looks like.

Colt Single Action Army

Colt Single Action Army

Finish type:	color case hardening	blue	nitre blue	nickel plate
Applied to:	frame, loading gate, hammer	barrel, cylinder, ejector assembly	trigger, base pin and bushing, screws	all component parts except springs and internal screws

Colt Double Action Army 1878

Finish type:	nitre blue	nickel plate
Applied to:	all component parts	all component parts except springs and internal screws. Hammers and triggers sometimes found nitre blued.

Marlin early models 1881, 1888, 1889, 1893, 1894 and 1895 lever actions

Finish type:	color case harded	slow rust blue	nitre blue	charcoal blue
Applied to:	Most receivers, hammer, buttplate, lever, forearm cap	barrel, magazine tube	breech bolt, carrier, gate, extractor, screws, pins, some hammers	some receivers

Colt Single Action Army (cont.)

Merwin-Hulbert revolvers

Finish type:	color case harded	nitre blue	charcoal blue	nickel-plated guns
Applied to:	hammer, barrel latch on blued or plated guns; some nickel-plated guns all nickel	screws, pins, triggerguard on blued guns	barrel, cylinder, frame	all except color case-hardened parts shown at left, but some factory nickel guns are all nickel, some have blued guards.

Smith & Wesson Top Break; American, Russian Single Action

Finish type:	color case harded	straw	nitre blue	charcoal blue	nickel-plated guns
Applied to:	hammer, guard, barrel catch, pawl, extractor gears always, even on plated guns	trigger	screws, pins	barrel, cylinder, frame	all except the color case hardened parts shown at left, grip screws always plated

Smith & Wesson Top Break; Schofield Single Action (nearly entire production is blued)

Finish type:	color case harded	straw	nitre blue	charcoal blue	nickel-plated guns
Applied to:	hammer, guard, barrel catch, cylinder catch, extractor pawl, extractor cam	trigger	screws, pins	barrel, cylinder, frame	all except the color case-hardened parts shown at left, grip screws were always nickel plated

Smith & Wesson Top Break; New Model Number Three Single Action

Finish type:	color case harded	straw	nitre blue	charcoal blue	nickel-plated guns
Applied to:	hammer, guard, barrel catch, cylinder catch, extractor pawl, extractor cam	trigger	screws, pins	barrel, cylinder, frame	all except the color hardened parts shown at left, grip screws were always plated

Smith & Wesson top break: all Double Action and Safety Hammerless models

Finish type:	color case harded	nitre blue	charcoal blue	nickel-plated guns
Applied to:	hammer, trigger	barrel catch, extractor cam, guard, screws, pins	barrel, cylinder, frame	all parts except color hardened parts shown at left, and triggerguards were always blued, grip screws were always nickel-plated

Winchester 1873, 76

Finish type:	color case harded	slow rust blue	nitre blue	charcoal blue
Applied to:	(sometimes receiver and side-plates) hammer, buttplate, finger lever, forearm cap	barrel, magazine tube	spring cover, extractor screws, pins	(sometimes receiver and side-plates), breech bolt

Winchester 1886

Finish type:	color case harded	slow rust blue	nitre blue	charcoal blue
Applied to:	early receivers, hammer, buttplate, finger lever, forearm cap	barrel, magazine tube	carrier, spring cover door, extractor, screws, pins	most receivers, breech bolt

Winchester 1892-early 1894

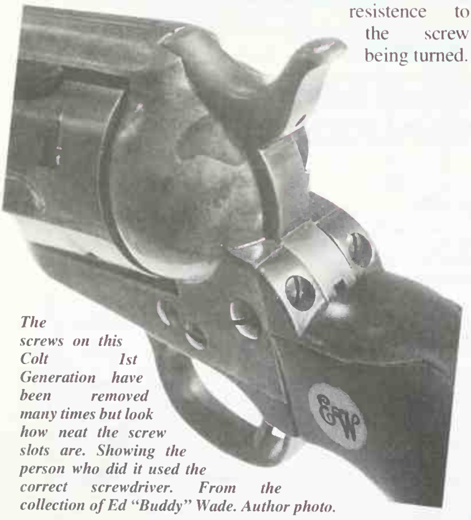
Finish type:	color case harded	slow rust blue	nitre blue	charcoal blue
Applied to:	a few early receivers. Most pre-1920; hammer, buttplate, finger lever, forearm cap.	barrel, magazine tube	spring cover, extractor screws, pins	most receivers, breech bolt

Screws and Pins

Removing old gun screws

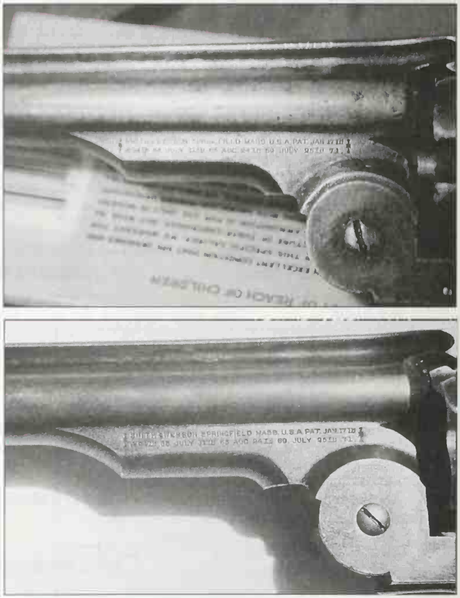
Keep it neat. I don't know if many of you readers have ever thought much about this, but the screws and pins on a firearm are often considered in conjunction with a gunsmith's signature. Why? Because perfect appearing screw slots and pin heads on a firearm, especially one that you know has recently been disassembled, offer up a strong suggestion that a real craftsman must have performed the work because he left it neat as a pin. On the other hand, bugged up screws, dents and marks on the gun's finish around screw and pin holes are widely regarded as the mark or "signature" of a butcher. Which of these would you rather be remembered as?

As anyone who has ever worked on old firearms knows already, getting the old screws out without damaging either the screw, or of much greater importance, the gun itself, can be one of the biggest challenges that we are faced with when working on older firearms. Whether the reason we need to remove the screws is to get inside so that we can repair some damage or simply to disassemble, inspect and clean, the bottom line is: those screws have to come out. Screws that have been in place for a long time will often be held fast by a coating of rust and/or of grease and oils that have hardened into a varnish-like glue over the years. Add to that the fact that most gun screws, particularly in well made weapons, were very closely fitted to exacting tolerances, on top of that their heads are often countersunk into the side of the receiver; all of the preceding factors increase the potential surface area of the screw and offer more areas which can be subjected to rusting, therefore more resistence to the screw being turned.



The screws on this Colt 1st Generation have been removed many times but look how neat the screw slots are. Showing the person who did it used the correct screwdriver. From the collection of Ed "Buddy" Wade. Author photo.

Screw slots. If all this weren't enough, old gun screws are equipped with straight, old-fashioned screw slots that are terribly inadequate, being easily damaged and broken. Since these old screw slots present the gunsmith with the only easy means of removing the screws, it would seem you have not been left with many options. Could there be more to these potential screw removal difficulties than all of this? Yes, I'm sorry to say there could. To compound the situation still more, some older guns used screws that were factory hardened in an effort to help prevent wear but many of these were actually hardened too much, to the point of being brittle. These kinds of screws have to be handled with extra-special care, lest the head shear off before the threads can turn! Oh, but there is more; some of the larger machine screws were regularly installed at the factory with a bit and brace, offering the installer big advantages of leverage when tightening the screw, probably past the point where it should have been. So you can see that if any kind of screw might be difficult to remove, it would surely be an old gun screw.



Here is a small example of how much difference the right screwdriver can make. These two Smith & Wesson Schofield revolvers show screws in the same location that have been handled very differently, the first joint pivot screw has been removed and replaced only once with a badly fitted screwdriver, the second has been removed and replaced several times with a perfectly fitted driver bit. Author photo.

Because of the above and those dainty screw slots, there is such a great chance of harming the weapon's exterior while the screws are being removed that this is the one portion of the chapter which I sincerely hope the reader will pay close attention to. We have established that this removal of the gun's screws is a critical area, now exactly what steps can we take to help us safely remove the screws from older firearms?

The right screwdriver. First and foremost your method should always be to use a high quality, hollow-ground gunsmith's screwdriver and more than that, one with a bit that fits the screw's slot as perfectly as you can possibly *make it fit*. Hollow ground gunsmith screwdrivers are made with *straight sided bits* so that they can fit all the way into the bottom of a *straight sided gun screw slot*. You can read more about screwdrivers in the tools chapter. Making sure the bit fits the screw slot is the key, in some instances this will mean you will have to do some grinding or filing on the screwdriver bit itself but it is all important that you do. The ideal situation you are trying to create is for the screwdriver bit to *fill the screw's slot*. What does *filling the slot* mean? To begin with it means you have to clean the screw slot of any and all old hardened grease and rust deposits. These accumulated crud deposits can be really hard, especially in weapons that are one hundred or more years old, therefore capable of resisting your efforts to insert the correct screwdriver bit into the slot. Use a strong dental pick to clean all the screw slots, scraping away any hardened deposits you find in the slots.

Once the screw slot has been cleaned so it can accept a driver, the term "filling the screw slot" means: #1; the bit should fit all the way from side to side in the slot, except perhaps a few thousandths of an inch on the sides so that the sides of the bit don't contact and scratch the metal surrounding the screw, it also means the bit should #2; fit the slot perfectly for width. When the bit is just tight enough so that you have to tap it just lightly with a hammer to make it drop into its seat in the slot, this is a perfect width fit. Finally #3; the bit should go all the way down into the bottom of the slot. When you have made your screwdriver bit fit all the above criteria, you have the perfect screwdriver, but . . . please don't use it just yet. To insure that we have done our level best, let's take every step we can to make the screws come out painlessly.

Heat and light penetrating oil are the ingredients we will use in our next steps. However, if the screw we have to remove is located in an area where there is wood or rubber (the stock or grip areas) and has to be removed in order to remove the stock (s), then using a lot of heat is out of the question lest we damage the stock, at least for the time being. You can apply small amounts of heat though, without damaging either of those heat sensitive materials by using a hair dryer set on a medium-to-high setting and by being careful never to heat the area any hotter than you can touch comfortably. Once you have the area around the screw head and if you can reach it, the screw threads, warmed up, apply small amounts of any good penetrating oil and re-heat the area. You may want to do this several times before attempting to use the screwdriver.

When there is nothing close by that the heat will damage, we can go a bit hotter and this step is always much more effective when trying to loosen stuck screws. Here we use a propane torch to heat the screw head and the area around it, as well as the threaded area when you can reach it. We do not want to use so much heat that we damage the metal finishes, and we will try to keep the temperature of the metal to the approximate range of just 250 to 300 degrees Fahrenheit. This is the point where a drop of water will "spatter and spit", at these temperature levels we should not do any harm to the metal's finish whether it be blued or plated. Once the metal is brought to this heat, remove the flame and quickly apply a small amount of any good penetrating oil, then re-heat the area as before. You may see tiny bubbles popping out around the screw's head or threads; this is a good indication that the oil is seeping around the screw. Continue the process by repeating it several times before you attempt to loosen the screw.

In places where there is a flat area surrounding both ends of the screw, you might want to consider using a screw-jack like the one we described in the chapter on tools. The screw-jack, when you are able to use one, offers you the ability to apply the maximum amount of turning torque along with the greatest downward force to hold the driver in the slot as well as excellent side-to-side stability for the driver bit.

As you make the first attempt to loosen the screw, make certain the screwdriver bit is "filling the screw slot", and always hold the screwdriver down straight into the screw with even more force than you will use to try and turn it. Always remember: It is far more important that the driver bit stays in the screw slot than it is for the screw to turn! If you let the bit slip up out of the screw slot, it will probably tear out the slot, and then you are dead in the water. Should the screw refuse to budge, just stop. Further attempts to turn it will likely end in frustration, the screw simply isn't ready to turn yet. Once again, let's try the heat and oil process from above, this time try using some of the Chrysler Heat Riser Valve Penetrant in place of whatever penetrant you were using before. Be patient, it may well take several recurring attempts at using this process before you get that penetrating oil into the threads and up under the screw head enough for it finally to let loose. However much time you spend here, when you begin to become angry; just think about how much less time this is taking than the amount of time you might have to spend if you were trying to drill out that same screw if it were broken as well as being frozen in place.

Ruined screw slots. But the screw head is badly bugged-up already, what do I do now? I always start by using the heat and penetrating oil treatments described above. Yes, I really do this even with a screw that seems

trying to create is for the screwdriver bit to *fill the screw's slot*. What does *filling the slot* mean? To begin with it means you have to clean the screw slot of any and all old hardened grease and rust deposits. These accumulated crud deposits can be really hard, especially in weapons that are one hundred or more years old, therefore capable of resisting your efforts to insert the correct screwdriver bit into the slot. Use a strong dental pick to clean all the screw slots, scraping away any hardened deposits you find in the slots.

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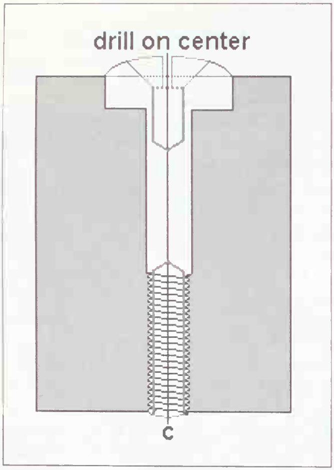
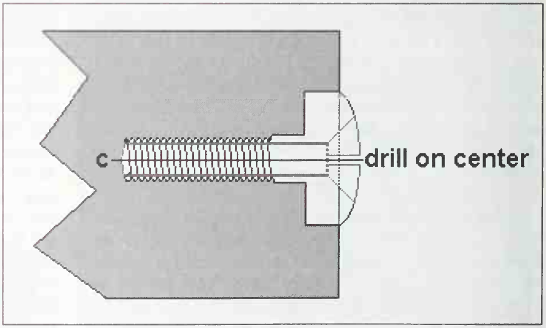


When you can get to both ends of the screw, center drill the threaded end first using a drill bit that is .004" to .005" smaller than the minor diameter of the screw threads to drill out the screw so all that remains holding the screw to the gun is a thin "shell", then use a pin punch to try and drive the head of the screw off.



For a blind screw, center drill through the exact center of the screw head and then drill down through the entire screw threaded portion with a drill bit that is .004" to .005" smaller than the minor diameter of those threads. Now all that remains of the screw shank is a thin shell and you should be able to turn the head off with a screwdriver, enabling you to disassemble the gun part the screw was holding, then the remaining portion of the screw threads can be removed by the tap-drill method.

offers you the ability to apply the maximum amount of turning torque along with the greatest downward force to hold the driver in the slot as well as excellent side-to-side stability for the driver bit.

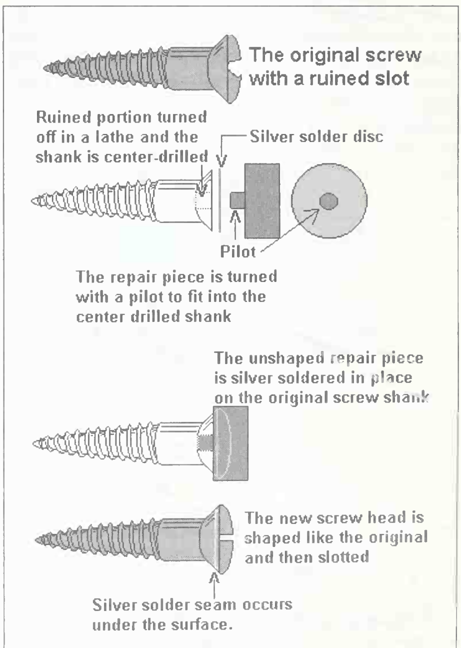
As you make the first attempt to loosen the screw, make certain the screwdriver bit is "filling the screw slot", and always hold the screwdriver down straight into the screw with even more force than you will use to try and turn it. Always remember: It is far more important that the driver bit stays in the screw slot than it is for the screw to turn! If you let the bit slip up out of the screw slot, it will probably tear out the slot, and then you are dead in the water. Should the screw refuse to budge, just stop. Further attempts to turn it will likely end in frustration, the screw simply isn't ready to turn yet. Once again, let's try the heat and oil process from above, this time try using some of the Chrysler Heat Riser Valve Penetrant in place of whatever penetrant you were using before. Be patient, it may well take several recurring attempts at using this process before you get that penetrating oil into the threads and up under the screw head enough for it finally to let loose. However much time you spend here, when you begin to become angry; just think about how much less time this is taking than the amount of time you might have to spend if you were trying to drill out that same screw if it were broken as well as being frozen in place.

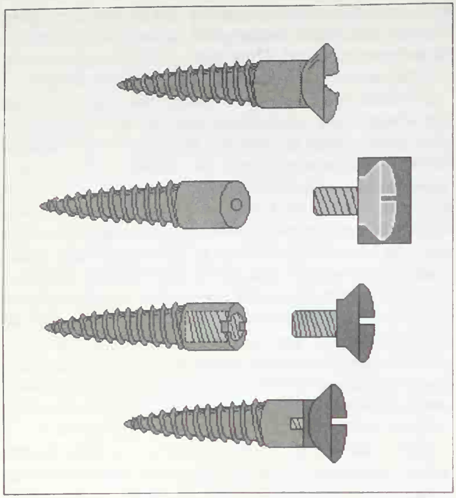
Ruined screw slots. But the screw head is badly bugged-up already, what do I do now? I always start by using the heat and penetrating oil treatments described above. Yes, I really do this even with a screw that seems to be hopelessly ruined because at some point during the removal process the fact that you have made the effort to free up the threads and other contact areas beforehand may very well make things much easier for you. In fact, if there is anything left of the slot at all, the heat and oil trick might just loosen things up enough so the screw can be turned out, although you may not have much of a grasp on it. Sometimes you can even use a carbide cut-off wheel to "repair" the damaged screw slot just enough so it will accept a wider screwdriver bit which may allow you to turn it out.

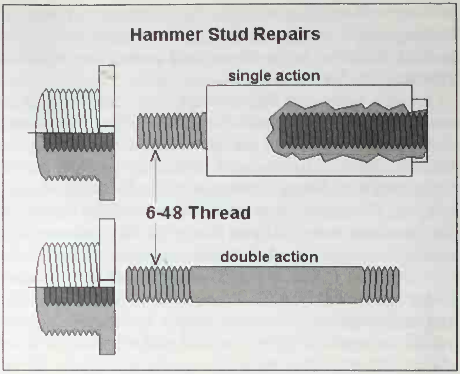
Drilling: The last resort. If none of the above works, we will just have to find a way to drill the screw out. This can be "touchy" work if we are to successfully drill out the old screw without causing even more damage to the weapon, so it is absolutely imperative that we not only find the exact center of the screw, but that we drill the screw in a straight line: right down its middle. Many make the mistake of starting a hole that looks like it's "really close" to the screw's center, but that isn't quite perfectly in the middle; "really close" isn't good enough for this job. Another common error that is made at this point occurs when you haven't bothered to make sure that the screw is exactly parallel to the drill bit in the drill press chuck. By making either or both of these mistakes then by the time that hole is drilled to the other end of the screw it could very well be off-center by a great deal, possibly causing you to drill a new hole through the gun's frame that doesn't belong there. Spend your time wisely by setting the job up correctly before you start to drill and it will pay big dividends.

Measure and center-punch mark the exact center of the screw. Now use a small carbide burr mounted in your hand grinder to carefully grind out a depression at the exact center of the screw slot. I always try to do this work under a magnifying glass, this makes it so much easier to find the exact center. Do exactly the same thing at the other or threaded end of the screw, assuming that end can be reached. "Dimpling" the screw ends offers you two advantages, first, if the screw is case-hardened you have broken through the hard steel into the soft core and it provides a more substantial center for the drill bit to bite into. Now that you have the centers well "dimpled", mount the weapon securely in a drill press so that you may drill perfectly straight into the center of the screw. Always start your drilled hole at the center of the "dimple" with a small, and very rigid center drill.

For screws that are not "blind", in other words; where the threaded end of the screw can be reached, using a twist drill that is about four to five-thousandths-of-an-inch smaller than the minor thread diameter of the screw, you may drill into the center of the threaded side of the screw down to a depth slightly deeper than the length of the screw's threaded area. At this point a







strong pin punch (slightly smaller in diameter than the drilled hole) is inserted into the newly drilled hole and struck with a hammer; this should literally rip the top off the remainder of the old screw, causing the entire screw to exit the side of the gun. The small "shell" portion of the old screw's remaining in the threads can now be removed by running the appropriate size of tap drill through the hole, then if you will very slowly and carefully start a tap into the hole, the tap will grab what remains of the old screw threads as it passes through. Yet another method may be: Since you have drilled out the majority of the screw and what remains are only a couple of thousandths-of-an-inch around the threads, the remainder may often be removed by tapping it around in the direction of removal using a small, sharp graver and a light hammer.

For blind screws, drill through the screw head on exact center, as above starting the hole with a rigid center drill, then follow up with a drill bit that is five thousandths-of-an-inch smaller than the minor diameter of the original screw thread and drill slowly through the whole depth of the screw to the bottom of the hole. Just as above, the piece of the old screw remaining in the threads may be removed by first running the correct size tap drill through to he bottom of the hole, and then carefully re-tap into the threads, removing debris from the old threads as you go, about every half turn of the tap wrench.

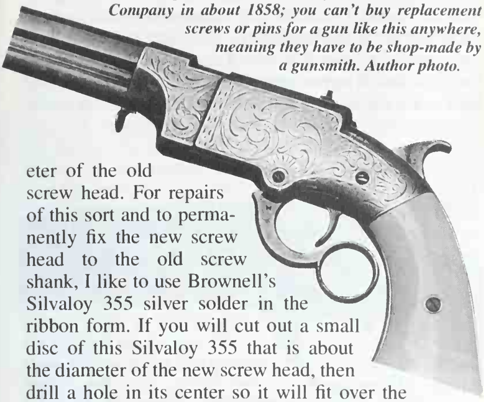
Unorthodox screw repairs

What happens when you want to make a new screw to replace a screw that has a badly ruined slot only you can't because either you do not have the capability to lathe cut its threads or you can't find a die to cut the threads with? A common example of this would be the case with many of the wood screws used in older firearms, particularly the large ones that have countersunk and domed heads like the ones they used to fasten buttplates or to hold metal tangs to the wood. Try as you may, it can be difficult or impossible to find any sort of modern replacement wood screws that will correctly fit these kinds of applications. When this happens we have to resort to some other means, means sometimes known as unorthodox.

The accompanying illustrations show a couple of methods to restore a screw head which the author has used as successful answers to these kinds of situations. In each instance the old screw shank is retained but a new head is presented for "external viewing only". Repairs such as these may also be suitable for use on the larger machine screws found in some firearms, and can be especially useful in situations where the screw is a complicated piece of work but the remainder of the screw aside from the damaged head is in perfect condition.

The first method of giving a new head to a screw will actually bond the new head onto the old screw shank. We begin by chucking the old screw in the lathe, grasping it by it's shank, then turning the head back just until you have begun to cut into the area which would fit into the counterbore where the screw head fits. You will be removing a substantial portion of the head in the process, including the whole top and the entire damaged screw slot. Next the now nearly headless screw shank is center-drilled as shown, this will provide a more substantial seat for a repair piece we'll soon be adding here that will eventually form the new head of the screw. This repair piece will be lathe-turned out of mild steel round stock to approximate the shape and the dimensions in the drawing and finally it will be silver soldered onto the top of old screw. The outside diameter of your repair piece will need to be at least the maximum diam-

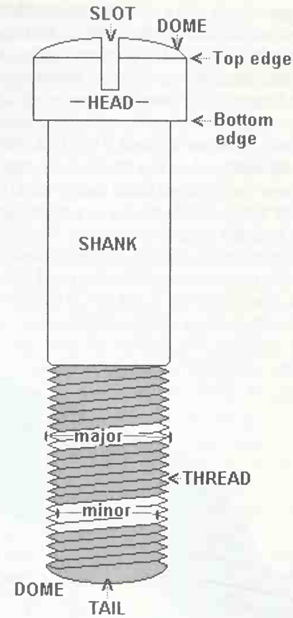
A volcanic pistol manufactured by the New Haven Arms Company in about 1858; you can't buy replacement screws or pins for a gun like this anywhere, meaning they have to be shop-made by a gunsmith. Author photo.



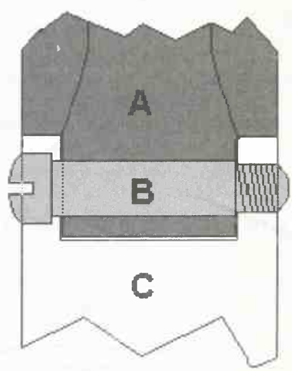
eter of the old screw head. For repairs of this sort and to permanently fix the new screw head to the old screw shank, I like to use Brownell's Silvaloy 355 silver solder in the ribbon form. If you will cut out a small disc of this Silvaloy 355 that is about the diameter of the new screw head, then drill a hole in its center so it will fit over the pilot on your repair piece, you will form a neat little "washer" of silver solder which is sandwiched between the two screw pieces with some liquid flux before heating the screw to melt the solder and form a strong bond.

This newly made repair piece will take the place of most, or in some cases the entire old screw head, but not to worry; if you've made a good job of the silver soldering, the joint should be plenty strong enough for almost any application. To complete your screw head repair, chuck the screw shank back in your lathe and shape the head into the diameter, height and configuration of the original screw head, at the same time taking care to restore that portion of the area which fits into the counterbore that you had previously cut away. Into this newly shaped screw head you may now cut your new screw slot, and since you have formed your new screw head so that its junction with the screw body is below the surface level of the metal it will be fitting into, this repair job should be invisible.

There is an alternative or second method of giving a new head to a screw, this procedure is entirely mechanical and involves no heat. Like we did with the first method, after removal of the old head the screw shank is center drilled but after this we deviate; the shank is now drilled and tapped for a machine screw thread as shown in the drawing. A new screw head will then be lathe-turned out of round stock so that it matches the original, only this new head is equipped with a "threaded tail" that will be sized to screw into that portion of the old screw shank which you have just drilled and threaded. In effect, you are making an odd little machine screw that will thread into the old wood screw. One very practical aspect of this repair job is that if necessary, it can be done to wood screws that are frozen in place in the stock. When you are finished with this repair, it not only appears as though the screw has been replaced with a new one; the part the screw is supposed to fasten to the stock will again be pulled down tightly onto the wood, as it was intended to be.

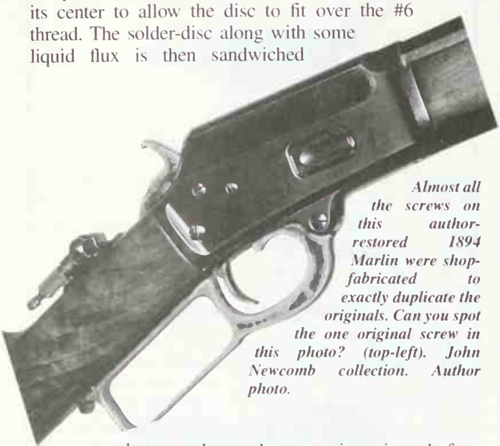


Parts of the screw



This cut-a-way drawing shows a barrel hinge on the Smith & Wesson tip-up revolver. Part "A" is the barrel, the hinge screw "B" passes through the barrel which tips-up or pivots on the shank of the hinge screw. After passing through the barrel's hinge area, the hinge screw is threaded into the revolver frame "C".

Broken or badly damaged hammer pivot studs (hammer studs) as well as other critical pivots that are screwed into the gun frame may also be successfully repaired using a process similar to the one described above, just as long as the larger threaded portion of the stud and its shoulder area are still intact. After removing it from the frame or receiver, the hammer (or whatever) stud is chucked in the lathe by its threads and center-drilled to about 90% of its depth with a #31 drill bit. This new hole is then bottom-tapped with a #6-48 screw thread, the old stud may now be removed from the lathe. At this point a repair piece which will form the new pivot portion of the stud may be lathe turned to suit the dimensions of the particular revolver (a couple of suggestions are shown) and a #6-48 thread cut on its bottom end. Once again, a small disc of silver solder is cut out of the Brownell's Silvaloy 355 ribbon silver solder and a hole drilled through its center to allow the disc to fit over the #6 thread. The solder-disc along with some liquid flux is then sandwiched



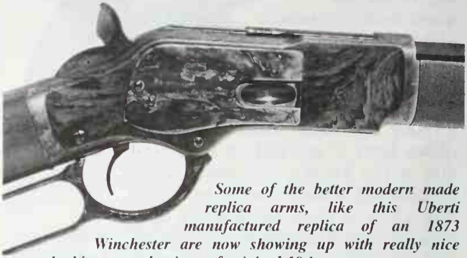
Almost all the screws on this author-restored 1894 Marlin were shop-fabricated to exactly duplicate the originals. Can you spot the one original screw in this photo? (top-left). John Newcomb collection. Author photo.

between the two hammer pivot pieces before final assembly and heating to permanently silver solder bond the two pieces together. All that remains when the piece has cooled is to clean off any carbon deposits and excess silver solder which may have flowed unto the pivot surface, re-install the stud and you're done.

Making gun screws and pins

Some thoughts on gun screws

The screws and pins which hold the various parts and pieces of a firearm together are important, but just as important as their function is their appearance, and this is especially true with older firearms. We have all seen and owned what were otherwise really fine guns over the years that had been made ugly by marred and mishandled screws and pins. In many cases with older, obsolete and antique arms, the original or correct replacement screws just cannot be purchased. All too often replacement parts are sold to us that are somewhat less than original looking, with screw slots that are too large, shanks that are undersized or too short and perhaps lacking the original "domed" heads. Often the only recourse we have in such circumstances is to manufacture, or to have manufactured, new screws or pins that are of the correct dimensions, hardness and of appropriate appearance for the obsolete firearm we are repairing, in other words to custom make



Some of the better modern made replica arms, like this Uberti manufactured replica of an 1873 Winchester are now showing up with really nice looking reproductions of original 19th century gun screws. Rifle courtesy Maria Uberti of Uberti USA. Author photo.

new screws and/or pins to suit this unusual application.

In this chapter we will deal with how you can manufacture your own factory-quality replacements for some of the "hard to get" screws and pins in popular Smith & Wesson, Colt, Winchester and other 19th century firearms. Refer to the individual chapters to get correct screw and pin dimensions and to see what the originals looked like so that you (or maybe even your local machine shop) can duplicate them. The manufacture of most gun screws or pins is not difficult, they are basically cylindrical in shape so they may be turned from round stock on a small lathe, although for the most part, gun screws will require a fairly high degree of precision during manufacture. Even re-creating some of the oddball screw thread sizes can be easier than you may imagine by adjusting or altering standard, modern thread dies, which often are very close to original thread dimensions, or as a last resort they can be duplicated by cutting the threads in a lathe.

There are other, often more compelling reasons why making your own screws can be a benefit to the repair process, and this is especially true when the gunsmith is attempting to restore proper mechanical operation to a weapon that is severely worn. Whenever a gun screw, or pin is used as a pivot point or as an axle of any sort within the mechanism, the shank of that screw or pin is subjected to wear, along with whatever parts are pivoting upon it. Replacing the worn axle point with a new original may work fine or it may not; just how well the replacement will work depends on how much wear is already present in the axle holes of those moving parts. This is one important reason why having the expertise to make your own screws with custom dimensions gives you the invaluable option of removing lost motion (play) in many areas where it might not be removed if

the pivot screw or pin were simply replaced with a standard-sized original part.

Some good examples of where this would come in handy can be seen when a screw forms part of a critical hinge, such as the barrel-hinge joint that Smith & Wesson used on their tip-up rimfire revolvers; when that hinge is disassembled the other surfaces that make up the hinge (the hole through the barrel and frame) are frequently discovered worn to a much larger diameter than that of the original screw shank. Replacing the old screw with a new "standard" screw would do you little, if any good in this case because when you were finished, the barrel would still be loose. In other instances the female (internal) threads might be found ruined within the firearm, forcing the gunsmith to ream and re-tap the screw hole to accept a slightly larger thread size. So too in a case where the screw that fits into this now-altered hole must first pass through *other parts* before reaching those larger threads, these *other parts* would have to have their axle holes reamed to an oversize that was compatible with the new screw's larger shank diameter; which in turn is mandatory because the screw hole now has a larger diameter thread. Situations like the above are quite common with older firearms that have seen a good deal of use and abuse, as the experienced gunsmith knows; to effect a proper repair, it is mandatory that a new screw be utilized, a screw that has its own special, customized dimensions that closely suit the specific occasion. Therein is the big advantage of making your own gun screws, you have the ability of creating such "special-custom screws" on an on-demand basis, to suit the peculiar circumstance at hand; the end result is reflected in a truly professional repair job.

Vintage screw heads and slots:

Domed, flat, round fillister, Phillips, Allen head, countersunk; what kind of screw head will an old gun use? That is an easy one to answer, fillister. Normally, and we will call this a "rule of thumb" since it is true in the clear majority of cases with 19th and early 20th century arms: If the screw's head (usually the larger end, always the slotted end) or its tail (the "other" end of the screw, opposite the head) showed on the outside surface of the firearm: Then it's head shape was slightly rounded, and this rounding is most often referred to as a dome. Until very recently all firearms without exception used screws with plain-slotted fillister-type screw heads. This plain-screw slot style was sometimes called a regular, straight or simple slot. The only minor exceptions to this will be found in the occasional stock-bolt on a rifle or shotgun where some gun factories, beginning in the early part of the 20th century used a hex (bolt) head in order to tighten the fastener more securely by using a socket wrench, but bolts such as these were always concealed within the butt stock. Phillips, Torx, Allen heads and the other more modern methods of screw driving simply did not exist before the latter portion of the 20th century, therefore they were never used and should not be considered correct for use on any older firearm. We'll have more on how to make regular old screw slots further on in this section.

What to make screws and pins from:

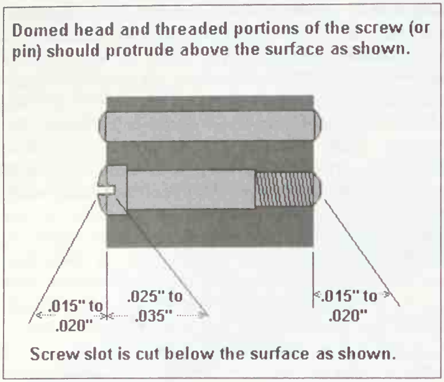
For basic screw stock or pin material you may use mild steel or you can use high quality steel drill rod. In either case it should be properly heat-treated to match its own unique application. Ready-made screw stock? I have made some use of a product which is marketed by Brownell's, Inc. under the trade name, "LaSalle Fatigue Proof" steel rod. These steel *rounds* are available in sizes that are suitable to be turned down and shaped for most gun screws and pins, and have the advantage of being suitably hard and tough "as-is" for a good many uses without any further treatment, yet the steel is easily machined. LaSalle rod left "as-is" may not be the best material for S&W top-break barrel catch screws for instance, where a harder material is desired, however the LaSalle product is excellent left "as-is" for making sideplate, strain screws and the like. I have made many, many screws with this material in the shop, it is of very high quality, machines very easily and blues readily by any method. For other applications, water or oil-hardening carbon steel drill rod, or even mild carbon steel rounds are an excellent screw stock material, although further heat treatment may be required for some uses as we noted above; such as when the screw is also a pivot for some other part or when it forms an action hinge. As we read through the various gun screws in their respective chapter headings, you will find that we've made note of this and have offered some suggestions on heat-treatment procedures.

Making pins:

In comparison with making screws, you will find making pins to be an easy task. The firearms addressed within the scope of this book are all factory-made, hence most of the pins we will have to deal with will be of the straight variety, so they may be removed and installed from either side. In the majority of gun pins, you may be able to simply choose the correct diameter of decimal sized drill rod, or steel round to suit your application, slice off a bit that is a tad too long, dome and polish the ends and voila; your basic pin is served. Always check first to see if there is not already a factory-made diameter of steel round that will exactly duplicate your needs for a pin; the chances are very good that between all of the decimal, fractional and metric sizes available today, you will find a ready-made round that will work for you. In cases where the pin you want to duplicate is a size which does not correspond with any commonly available round stock, the easiest method is to select the closest size decimal drill rod round to your application, chuck it in the lathe and polish it down to the size you need while it's spinning.

Do gun pins have to get hardened? Yes, in many cases they do. A pin that holds a lanyard ring, or one that acts as a locator for handgun grips for instance,

would be the exception and there would not be any reason to bother using anything other than a soft pin. Pins that will be used in stressed applications such as pivots or axles for any action parts are quite another story, and these should certainly always be hardened to protect them against wear and breakage. Follow the comments on heat-treating below, near the end of the screw-making process, to harden and temper the new pins exactly as you would heat-treat a newly made screw that was to be used in a similar application.



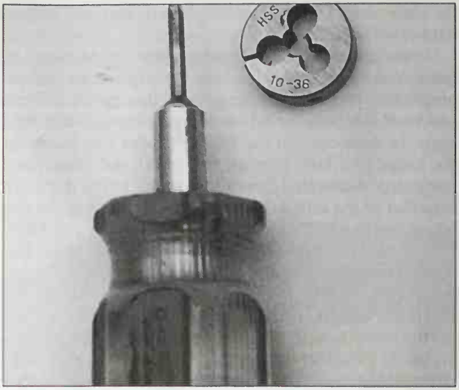
To dome or not to dome?

The great majority of 19th century firearms used dome-headed pins and screws whenever a portion of either end of the fastener showed on the outside of the weapon. If you are unsure about whether your specific firearm used domed headed fasteners, try to get a look at an original, unmodified specimen before you begin to put a dome on yours.

How much "extra-length" do you leave on the ends of the new pin so there is enough left to shape the ends into domes? You can leave .020" or twenty-thousandths-of-an-inch on each end of the raw pin, this will leave plenty of material for you to form a nice, gently rounded dome that ends up being about .015" (fifteen-thousandths-of-an-inch) higher than the edge of the metal where the pin fits into on each side.

On a new screw, remember to leave about .025" to .030" (that is; twenty-five to thirty-thousandths-of-an-inch) more material above the level of the frame or the top surface in the area of the gun where the screw fits into, this saves enough material for you to shape a dome twenty-to-twenty-five-thousandths high.

Shaping the screw's dome. Establish a *scribed parting line* on the side of the screw's head or on the side of the pin that matches with the exact level of the top of the surrounding area where the screw or pin fits into when it is installed and tightened. Chuck the screw or pin in the lathe and use a small lathe angle file while the screw or pin is spinning (on smaller screws and pins, this can be done using a small hand-drill chuck) to gently shape a rounded dome, being careful not to remove metal below the parting line you scribed earlier on the side of the screw or pin head.



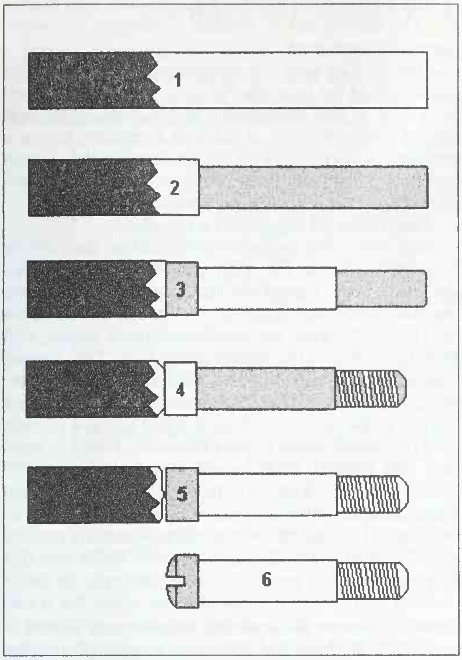
Many of the obsolete gun screw threads are very close to modern standards and may be duplicated on the "male" screw by using an adjustable die like this one. Author photo.

Making screws; how to do it.

Screw stock lengths: Let's get started with a piece of drill rod or steel round which we will establish as being at least the "length of the finished screw . . . plus two inches" (you have to hold the screw stock to work on it, so you will need these extra two inches for use as a chucking surface) plus another three-tenths of an inch (this is to allow some extra material for final shaping of the head and thread ends, plus a small amount that will be lost when the screw is cut-off the parent stock.) Thus, if your proposed new screw is to have a finished overall length of .750"; then you will add 2.00" and .300" to the .750" for an overall *minimum* beginning stock length of 3.050". Of this overall length, you will be grasping about two inches in the lathe chuck; leaving about 1.050" remaining protruding out into the ways for you to work on.

If the finished screw is much longer than about one inch, or if you know the threads will have to be lathe cut, then more stability will be required to keep the stock spinning true without having it flex during the turning or threading process. For longer screws like this, you should consider leaving yet another quarter inch of extra length on the new stock so the front of the stock, allowing enough so it can be center drilled slightly to form a seat so the lathe's tail-stock center can be held into the front of the screw stock for rigidity.

Screw stock diameters: Always try to begin with a round rod diameter that is much larger than is apparently required. As an example: If your finished maxi-



mum screw diameter (normally the maximum will be the diameter of the screw head) was to be .170", then you should start with a piece of 3/8" (.375") round stock, or just about double the finished maximum diameter of the screw. *Why should I do that, when I can use a piece of 11/64" drill rod which is already .1719"?* Sure, you can turn this screw from a smaller diameter rod that is closer to the finished screw size, but within reason, the larger the diameter basic stock the more rigidity you will have during cutting; that rigidity will ease the turning job for you.

Most gun screws are fairly short in comparison with their diameter, and as long as you start with a large enough piece of round stock, they will remain rigid enough so that you will be able to turn them out with placing the outer end of the round stock on center. Further, most of the screw threads we will have to form may be cut with an adjustable die held in a die-stock, so there is no need for that great degree of rigidity that lathe-cutting the threads would demand. For the odd screws that are over about one and one half inches in overall length, and, in all cases where you know you will have to lathe-cut the threads as suggested above, I would strongly recommend that you center-drill one end and place the stock in the lathe chuck with a live center in the lathe's tail-stock for rigidity during the turning and threading processes.

Screw threading and dies:

Since the second World War, most of the firearms manufacturers in this country have brought their screw and thread sizes into order to compliance with S. A. E. (Society of Automotive Engineers) standards. That was not the case years ago when it was more economical for most of the gun companies to make their own screws to suit their own standards. Gun company standards may, but just as often may not, have been in conformance with any other industry standards so a good deal of what we find in older firearms, especially those made before World WarII are today basically custom sizes. As you can see from the chart at the end of this chapter, even though older gun screws are different from most modern gun screws, most of them share the same 60 degree "V" thread and a good many of them use the same number of threads per inch, only differing substantially in their diameters.

Earlier we mentioned a barrel catch screw for the large S&W top-break revolvers, the thread used on this screw is a good example of an obsolete gun company custom size whose threads may be duplicated easily by adjusting a standard #8-36 die to suit the original Smith & Wesson major thread diameter. There are many instances when an adjustable die of modern size which is very *close* may be used in this manner, after only being adjusted to suit the original screw thread dimensions. In the interest of both economics and speed,

For the shop without a heat-treating oven Tempilaq is just the thing. The product brushes on and when dry, it will melt only at the specified temperature, this one melts at 1500 degree Fahrenheit. Author photo.

whenever possible I try to use modern adjustable dies to thread custom gun screws I am making. Sometimes that method just doesn't seem possible, since some older screws are in sizes that are no longer made, like the number 7 or number 9 screw sizes. There are a few industrial supply houses (see the end of this chapter) that still carry older or odd thread sizes and screw diameters that they call "special thread sizes" and these can be a terrific source for the gunsmith who is trying to duplicate some of these "screwy" thread sizes with dies.

Steps to screw turning and threading:

Here are six easy steps (as shown in the illustration,) you may use as a basic guideline to help you manufacture your own new screws in a metal lathe. In the illustration, in every case, the darkened area shown on the left of the screw stock is the chucking area.

Step 1: The raw-round stock is centered and tightened in the lathe chuck, after using the formula for determining finished length as described above.

Step 2: The full length of the shank under the screw head is turned, leaving the shank fifty-thousandths-of-an-inch longer than required.

Step 3: The screw thread length is turned to the maximum diameter of the future thread, creating the shank area to about its exact length, but leaving the area which will accept the threads fifty-thousandths longer than required. Lastly, the rough diameter of the screw head is turned, leaving the length of the screw head fifty-thousandths longer than required.

Step 4: Screw threads are die-cut or lathe-turned to their final diameter and length. The threaded shank is shortened to its final length and the tail dome shaped if required. The un-threaded shank is polished to its exact final diameter. A parting cut is begun in the chucking portion of the stock, behind the over-length screw head.

Step 5: The screw head is polished to its final diameter. The parting cut is finished, separating the screw from the parent stock.

Step 6: The screw is chucked by its un-threaded shank area in the lathe chuck. The screw head is turned to within a few thousandths of its final length and domed. The screw slot is cut with a jewelers saw or a carbide cut-off wheel. Final fit the screw to the weapon and final polish both the screw head and the screw tail as outlined later in this chapter before heat treating.

Back to the all-important screw slot:

Here are a few thoughts about cutting the slots in your new screws: For 19th and early 20th century American guns, a good slot width for most gun screws that fall within the range of #4 through #10 is about .025" to .035" wide, the narrower slots of course, will be in proportion to the smaller screw sizes. The shape of your nice, new narrow screw slots should be flat-bottomed and square-sided. Screw slots can be cut with a jeweler's saw, screw slot files, a screw slot saw or even with the cut-off wheel in your Dremel or Foredom hand tool (the Dremel #409 cut-off wheel is about .032" wide.) You may want to remove your almost finished screw from the lathe and mount it in a padded vise so that the slot can be cut more readily. Whichever method you decide to use to cut the screw slot, make sure that you center the slot perfectly before you begin the cut; a crooked or off-center screw slot can make the whole screw job look unprofessional, and then you'll have to go back to the lathe and start all over again. Some factory guns, and most 18th and 19th century hand-made guns can properly display screw slots that are off-center. The exact depth of the screw slot will depend on the screw head depth, in general you should cut the slot so that it extends about twenty-five-thousandths minimum *below the edge level* of the domed head in order to look correct and to give the screwdriver bit a sufficient purchase.

Some basic thread dimensions and tap drill sizes. *denotes an obsolete or rarely used size.

Nominal thread	Major diameter	Minor diameter	Tap drill
3-48	.0990"	.0719"	47
3-56	.0990"	.0758"	45
4-40	.1120"	.0795"	43
4-48	.1120"	.0849"	42
5-40	.1250"	.0925"	38
5-44	.1250"	.0955"	37
6-40	.1380"	.1055"	33
6-48	.1380"	.1109"	31
7-32 *	.1510"	.1104"	31

Nominal thread	Major diameter	Minor diameter	Tap drill
7-36 *	.1510"	.1149"	1/8"
8-32	.1640"	.1234"	29
8-36	.1640"	.1279"	29
8-40	.1640"	.1315"	28
9-32 *	.1770"	.1364"	26
10-32	.1900"	.1494"	21
12-28	.2160"	.1696"	14
12-32	.2160"	.1754"	13

Screws: Colt Single Action Army, first generation

Screw chart nomenclature: A) screw head width. B) screw head overall height. C) screw slot width. D) screw slot depth. F) un-threaded shank diameter. G) thread major diameter. H) un-threaded shank. length. I) thread length. J) overall length. T) thread specifications (TPI=threads per inch. RH=right hand)

Screw	A	B	C	D	F	G	H	I	J	Thread
Hammer, 1st Gen	.290"	.165"	.035"	.075"	.225"	.225"	.500"	.285"	.950"	24 TPI RH
Bolt, 1st	.220"	.120"	.032"	.060"	.131"	.195"	.595"	.150"	.875"	24 TPI RH
Trigger, 1st	.220"	.120"	.032"	.060"	.131"	.195"	.601"	.150"	.881"	24 TPI RH
Ejector tube, 1st	.218"	.320"	.032"	.060"		.140"		.150"	.470"	40 TPI RH
Gate detent, 1st			.035"	.035"		.202"			.175"	32 TPI RH
Mainspring, 1st	.300"	.115"	.038"	.065"		.195"		.360"	.475"	24 TPI RH
Back-strap, top, all	.210"	.135"	.032"	.060"		.162"		.390"	.525"	36 TPI RH
Back-strap, bottom, all	.210"	.070"	.032"	.035"		.162"		.300"	.370"	36 TPI RH
Guard, rear, all	.210"	.135"	.032"	.060"		.162"		.395"	.530"	36 TPI RH
Guard, front, all	.210"	.070"	.032"	.035"		.162"		.300"	.370"	36 TPI RH
Bolt/Trigger spring	.240"	.073"	.032"	.040"		.160"		.162"	.235"	36 TPI RH

Screws: Marlin 1881

Screw chart nomenclature: A) screw head width. B) screw head overall height. bb) screw dome height. C) screw slot width. D) screw slot depth. E) pilot, width. ee) pilot, overall height. F) un-threaded shank diameter. G) thread major diameter. H) un-threaded shank, length. I) thread length. J) overall length. T) thread specifications (TPI=threads per inch. RH=right hand)

Screw	A	B	C	D	E	ee	F	G	H	I	J	Thread
Hammer	.270"	.065"	.035"	.035"	.181"	.725"		.205"		.185"	.975"	40 TPI RH
Lever catch	.212"	.090"	.032"	.045"				.136"		.240"	.330"	44 TPI RH
Lever pin	.490"	.080"	.032"	.050"				.220"		.320"	.400"	40 TPI RH
Mainspring	.325"	.115"	.035"	.050"				.166"		.360"	.475"	40 TPI RH
Tang	.330"	.115"	.035"	.065"			.235"	.232"		.250"	1.805"	36 TPI RH

Screws: Remington Double Derringer

Screw chart nomenclature: A) screw head width. B) screw head overall height. bb) screw dome height. C) screw slot width. D) screw slot depth. E) pilot, width. ee) pilot, overall height. F) un-threaded shank diameter. G) thread major diameter. H) un-threaded shank, length. I) thread length. J) overall length. T) thread specifications (TPI=threads per inch. RH=right hand)

Screw	A	B	C	D	E	ee	F	G	H	I	J	Thread
extractor	.118"	.040"	.025"	.020"	.073"	.030"		.097"		.095"	.165"	48 TPI RH
hinge	.225"	.085"	.030"	.050"			.165"	.162"	.255"	.270"	.610"	40 TPI RH
locking bolt	.292"	.040"	.030"	.025"				.116"		.120"	.160"	40 TPI RH
mainspring	.185"	.080"	.032"	.040"				.133"		.312"	.392"	40 TPI RH

Screw sizes for Model No. 3, large frame S&W top-break revolvers

Screw chart nomenclature: A) screw head width. B) screw head overall height. bb) screw dome height. C) screw slot width. D) screw slot depth. E) pilot, width. ee) pilot, overall height. F) un-threaded shank diameter. G) thread major diameter. H) un-threaded shank. length. I) thread length. J) overall length. T) thread specifications (TPI~threads per inch. RH~right hand)

Screw	A	B	bb	C	D	E	ee	F	G	H	I	J	T: Thread
Sideplate, center SA	.199"	.105"	.015"	.025"	.050"	—	—	—	.104"	—	.200"	.305"	46TPI~RH
Sideplate, frt & r, Amer.	.199"	.105"	.015"	.025"	.050"	—	—	—	.104"	—	.140"	.245"	46TPI~RH
Sideplate, frt & r, long	.199"	.105"	.015"	.025"	.050"	—	—	.105"	.104"	.441"	.230"	.776"	46TPI~RH
Barrel catch, exc Schof.	.237"	.120"	.020"	.030"	.060"	—	—	.168"	.167"	.460"	.170"	.750"	36TPI~RH
Joint Pivot, 1st American	.249"	.142"	.020"	.035"	.060"	—	—	.190"	.149"	.498"	.185"	.825"	36TPI~RH
Joint Pivot, 2nd Am & Rus	.289"	.095"	.020"	.035"	.060"	—	—	.228"	.144"	.615"	.400"	.695"	40TPI~RH
Joint Pivot, all other	.289"	.095"	.020"	—	—	—	—	.228"	.144"	.615"	.400"	.695"	40TPI~RH
Joint Pivot screw	.289"	.095"	.020"	.035"	.060"	—	—	—	.143"	—	.255"	.345"	40TPI~RH
Joint Pivot lock screw	.199"	.095"	.015"	.025"	.050"	—	—	—	.104"	—	.070"	.165"	46TPI~RH
Cylinder catch, 1st Amer	.154"	.095"	.015"	.025"	.050"	—	—	—	.104"	—	.150"	.345"	46TPI~RH
Cyl catch, 2nd Am & Rus	.235"	.110"	.020"	.030"	.065"	.164"	.050"	.166"	.164"	.062"	.240"	.412"	36TPI~RH
Cyl catch, 3rd Russian	.500"	.110"	—	.090"	.075	.164"	.050"	.166"	.164"	.062"	.240"	.412"	36TPI~RH
Cyl. Catch, Schofield, Frt	.197"	.093"	.015"	.030"	.050"	—	—	.144"	.134"	.535"	.150"	.778"	40TPI~RH
Cyl. Catch, Schofield, R	.197"	.093"	.015"	.030"	.050"	—	—	.144"	.134"	.535"	.155"	.778"	40TPI~RH
Brl catch, Schofield, 1st	.197"	.073"	.015"	.030"	.050"	—	—	.106"	.104"	.520"	.185"	.780"	46TPI~RH
Brl catch, Schofield, 2nd	.197"	.073"	.015"	.030"	.050"	—	—	.128"	.126"	.540"	.165"	.778"	40TPI~RH
Strain, Am, Russ., Schof	—	—	.015"	.030"	.050"	—	—	.149"	.149"	—	all	.420"	32TPI~RH
Strain, NM #3	.236"	.090"	.020"	.030"	.060"	.133"	.100"	.170"	.166"	.450"	.535"	1.165"	32TPI~RH
Strain, DA	.236"	.090"	.020"	.030"	.060"	.133"	.100"	.170"	.166"	.400"	.475"	1.065"	32TPI~RH
Grip, all SA	.193"	.100"	.015"	.030"	.060"	—	—	.132"	.132"	.980"	.200"	1.080"	40TPI~RH
Guard, front	.235"	.098"	—	.030"	.060"	—	—	.166"	.164"		.190"	.400"	36TPI~RH
Guard, rear	.235"	.110"	.020"	.030"	.060"	—	—	.166"	.164"		.240"	.412"	36TPI~RH
Extr. Lock screw, Amer.	.154"	.095"	.015"	.025"	.050"	—	—	—	.104"	—	.215"	.590"	46TPI~RH
Rack screw, American	.199"	.105"	.020"	.030"	.050"	—	—	.130"	.129"	2.235"	.400"	2.740"	40TPI~RH

Screws for small frame S&W top-break revolvers

Screw chart nomenclature: A) screw head width. B) screw head overall height. C) screw slot width. D) screw slot depth. E) pilot, width. ee) pilot, overall height. F) un-threaded shank diameter. G) thread major diameter. H) un-threaded shank. length. I) thread length. J) overall length. T) thread specifications

Screw	A	B	C	D	E	ee	F	G	H	I	J	T: Thread
Barrel catch, .32 cal.	.165"	.112"	.032"	.060"	—	—	.121"	.120"	.475"	.155"	.587"	44TPI~RH
Barrel catch, .38 cal.	.180"	.105"	.032"	.060"	—	—	.145"	.143"	.500"	.165"	.605"	40TPI~RH
Joint Pivot screw, .32 cal	.250"	.075"	.035"	.060"	—	—		.120"	—	.235"	.310"	44TPI~RH
Joint Pivot screw, .38 cal	.250"	.075"	.035"	.060"	—	—	—	.120"	—	.250"	.325"	44TPI~RH
Hammer stud nut	.252"	.150"	.032"	.050"	—	—	—	.131"	—	.090"	.150"	40TPI~RH
Strain, .32 SA	.235"	.110"	.032"	.065"	.164"	.050"	.166"	.164"	.062"	.240"	.412"	32TPI~RH
Strain, DA	.220"	.130"	.032"	.050"	.102"	.080"	.106"	.104"	.695"	.500"	.825"	32TPI~RH
Sideplate, rear SA & ND	.170"	.075"	.032"	.040"	—	—	—	.102"	—	.140"	.215"	46TPI~RH

Smith & Wesson Tip-up Barrel Hinge Screws

Screw chart nomenclature: A) screw head width. B) screw head overall height. C) screw slot width. D) screw slot depth. F) un-threaded shank diameter. G) thread major diameter. H) un-threaded shank. length. I) thread length. J) overall length. T) thread specifications (TPI~threads per inch. RH~right hand)

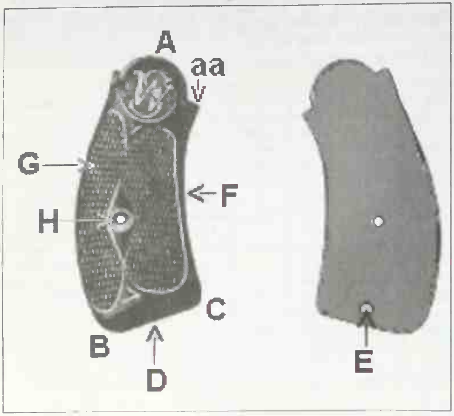
Model	A	B	C	D	F	G	H	I	J	Thread
Model 1	.158"	.070"	.030"	.035"	.105"	.103"	.270"	.164"	.505"	44 TPI RH
1 O.M.	.158"	.070"	.032"	.035"	.105"	.105"	.324"	.175"	.564"	44 TPI RH
1 N.M.	.171"	.070"	.032"	.035"	.105"	.105"	.372"	.165"	.550"	44 TPI RH
Model 2	.198"	.070"	.032"	.035"	.135"	.133"	.372"	.200"	.642"	40 TPI RH

Screws: Winchester 1873

Screw chart nomenclature: A) screw head width. B) screw head overall height. bb) screw dome height. C) screw slot width. D) screw slot depth. E) pilot, width. ee) pilot, overall height. F) un-threaded shank diameter. G) thread major diameter. H) un-threaded shank. length. I) thread length. J) overall length. T) thread specifications (TPI~threads per inch. RH~right hand)

Screw	A	B	C	D	E	ee	F	G	H	I	J	Thread
carrier spring lever spring	.200"	.110"	.030"	.045"				.133"		.270"	.380"	36 TPI RH
Finger lever	.245"	.095"	.032"	.050"			.195"	.192"	.750"	.250"	1.095"	36 TPI RH
Mainspring	.245"	.145"	.035"	.065"			.177"	.177"	.075"	.250"	.470"	36 TPI RH
Mortice cover	.200"	.070"	.030"	.030"				.135"		.170"	.240"	48 TPI RH
Sideplate	.242"	.110"	.035"	.050"			.185"	.184"	.860"	.250"	1.220"	36 TPI RH
Side Tang	.242"	.110"	.035"	.050"				.184"		.240"	.350"	36 TPI RH
Tang	.345"	.120"	.035"	.065"			.205"	.205"	1.34"	.340"	1.80"	36 TPI RH

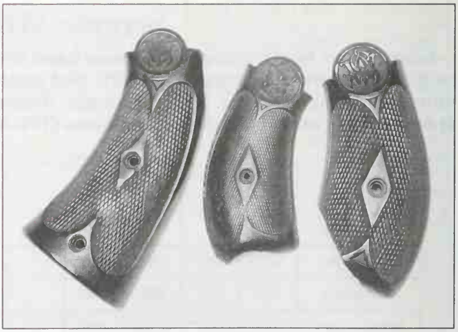
Revolver grip repairs



Revolver grip nomenclature: A) Stock Circle. aa) Stock Shoulder. B) Heel. C) Toe. D) Butt. E) Stock Locating Pin Hole. F) Border. G) Checkering. H) Escutcheon.

Old grip notes: When we encounter a very heavily used old revolver with badly worn or broken grips, the normal first impulse is I suppose, to toss out those grimy beat-up old grips and immediately replace them with shiny, factory new ones. While replacing the original grips might seem to be a good notion in some cases, the idea of keeping its own original grips with an antique revolver is usually more in line with what we are after. Remember, we shouldn't be trying to change history; we should be trying to save it. Furthermore, with many old revolvers the correct original replacement grips are no longer available. That circumstance is especially true for some of the frontier-era pistols we will be dealing with, presenting us with yet another good reason to do our best to try and salvage, repair and restore what we have. Yes, there will be times when, even after your best efforts to save them you will find the old grips are just too far gone to be redeemed, although I must confess that this only makes attempting the job more of a challenge for me; a foolish, stubborn trait which has at times cost me a good deal of wasted time. On the other hand at least to some degree because of this dogged persistence, I've also managed to develop some methods of "creative" repair which have enabled me to salvage a larger percentage of these grimy, beat-up old handgun grips than I would have thought before I tried. Here a few of the more useful little tricks that you might be able to use to repair even some of the more pitiful looking revolver grips, presented for the gunsmith or hobbyist who doesn't happen to be in any particular hurry.

Hard rubber grip repairs. Many people believe that the old revolvers like Smith & Wesson and Merwin-Hulbert must have used a plastic material for their grip panels, since we see many of these types of older revolvers with grips that were obviously mold-cast with intricate details from some material other than wood. The truth is that these grips were made long before anybody knew what our modern plastics were. In the Victorian-era the material of choice was hard rubber, and in its day it performed many of the functions that our plastics do, although the down-side was that once cast and hardened it was a very brittle material that became even more so with age. This material was hot-cast as a liquid into molds where it was allowed to harden and set, in this manner it was possible to reproduce grips and other small decorative items by the thousands, the arms industry (and other industries) used it, in some cases up into about the middle of the 20th century. In the mid- 19th century when it came into common use for handgun grips, hard rubber was inexpensive, easily molded into complex shapes and had the ability to be molded with intricate detail so that the product could be put to use almost "as is", with very little, if any hand-work right out of the mold. At one time they used to like to call hard rubber by another name: gutta-percha (a Malay word, when loosely translated it means *sap-cloth.* Gutta-percha sometimes refers to the tree, its sap and/or the sap products.) Gutta-percha is a name for the rubbery substance which is derived from the latex sap of several types of Malaysian palaquium or payena trees. The natural color of this material is actually varying shades of brown although the commonly found handgun grip color of course is black, a few rare specialty grips were cast in red or white and black *mottled* colors. These colors were achieved by dyeing the rubber beforehand. After years of exposure to sunlight, you may see some black hard-rubber grips that have faded back into various brown shades.

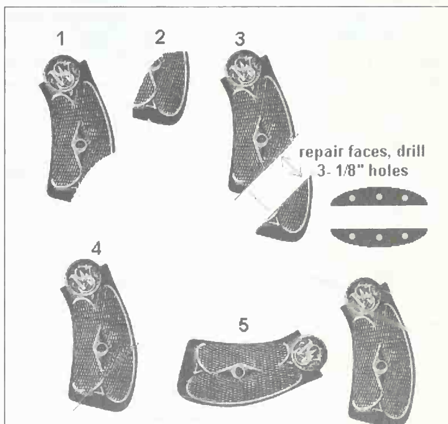


These three damaged hard rubber grips are all from S & W products and present a good sampling of the kinds of breakage often found due to the brittle nature of gutta-percha. The left grip is from a single-shot pistol and its thin "web" is broken out at the top-rear. The other two are both broken from being dropped or hit. Author photo.

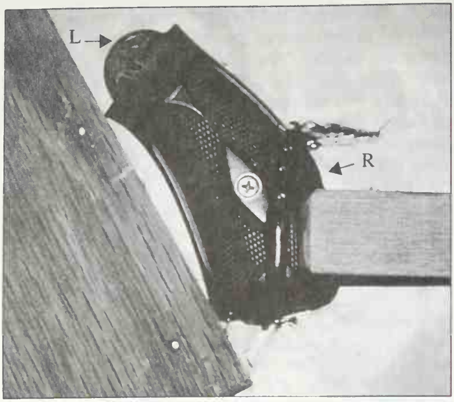
On the back side, the left grip is from a .44 S&W double action that has been dropped on a hard surface. On the right is a .38 double action S&W grip, the chip broke out because someone tried to force it onto a gun before fitting it to the grip frame. Author photo.

I mentioned above that the down-side of hard rubber was its brittleness, in fact the reason it was called *hard rubber* was because it was *hard*. Most of the repair problems with hard rubber grips will come in the form of chips or cracks after the gun has been dropped, from someone trying to force off a shrunken, tight fitting pair or while forcing on a new pair. In the worst cases of this, whole pieces or chunks of the grip may be missing and that is especially true in the butt area. Being something of a packrat, I have long saved pieces of old broken hard rubber grips so I have accumulated quite a large collection of these broken pieces over the years. You wouldn't be the first to ask me why in the world was I saving all this worthless junk. It would seem to be easier all the way around to simply toss em' in the trash, after all, of what use can broken grip pieces be? Actually, they can be of great use, for these scraps will become the perfect patching material that you can use to repair other broken hard rubber grips with, and for that purpose they are almost worth their weight in gold.

The accompanying illustration shows an example of one process that you might use to repair a hard rubber grip. This one has had a large section of its butt broken off at the "heel" of the grip. We are also assuming for the sake of argument that the precious broken piece had long ago been lost as shown in Step 1. In Step 2, we show a section of the butt from the same kind of grip that has been selected for use as a repair section, after fitting this will be bonded together with the original grip piece by using Acraglas Gel which has been dyed black. As you can see the piece selected is slightly larger than the broken area of the original grip shown in Step 1. Both the broken face of the original grip and the repair piece are carefully filed (at 90 degrees to their back sides) until both these pieces present perfectly flat surfaces that will mate-up as closely as possible, as shown in Step 3. Spend the time here carefully filing and fitting to try and make the grip borders and the checkering patterns of both pieces align as closely as you possibly can. We like to drill two or three holes vertically into the glue-faces of each part like the ones shown in Step 3, taking care to align the holes as closely as possible, they don't have to line up perfectly just close enough to allow the holes to fill with the epoxy resin we will use to bond the two pieces together later, this will add strength to the finished repair. For Step 4, clean both glue-faces with denatured alcohol and set them aside to dry for five or ten minutes. Now place the larger piece (the original grip) on a piece of 3/4" pine board that you have previously covered with a sheet of waxed paper (the waxed paper keeps the Acraglas Gel from adhering to the wood) and fasten it to the board through the grip screw hole with a tiny wood screw, using other screws at two corners of the grip to keep the grip from moving around during the glueing and clamping process. Next, the repair faces of both pieces are liberally coated with a black-dyed mixture of Acraglas Gel. Take some care that you force the Acraglas Gel into the pre-drilled holes in the glue-faces we discussed earlier. Push the smaller piece onto the waxed paper, lining it up as you do with the original grip edges and borders. A small



1-The broken hard rubber grip. 2-Select a piece from the same section of an old grip that is slightly larger than the broken area. 3-File both repair faces flat until the borders of the grip are a perfect match, drill 1/8" holes in each repair face to hold epoxy. 4-Screw the grip to a waxed paper covered wooden block and clamp the repair piece in place with black epoxy in the seam, use care to hold the two pieces aligned. 5-Dress up the borders and the checkering, clean any excess epoxy off the back side and your repair is done.



A broken hard rubber grip (L) showing the repair piece (R) that was shaped from another broken grip being bonded to it using Acraglas gel dyed black. The grip, here sitting on waxed paper, was secured to a pine board using a small wood screw while the repair piece is held in place tightly with a home-made clamp made from a scrap of hard-maple held with a dry-wall screw. Author photo.

rectangular block of hardwood about a half inch thick, an inch wide and six inches long with a wood screw through its center can make an effective and inexpensive clamp to hold the smaller piece down and firmly against the larger one while the assembly is set aside to cure for at least 24 hours.

After your Acraglas Gel has fully cured and hardened, the clamp and the retaining wood screw may be removed from your repaired grip and the grip can be lifted off the board by carefully tearing it away from the waxed paper. The next step: Step 5 is the shaping process. Starting with the outer edges of the grip, use a small bastard file to slowly and carefully remove excess Acraglas Gel until you have worked the area down and have reached the original contours of the outside borders of the grip. Now begin to use a small half-round bastard file to cut the excess Acraglas Gel down to size in the checkered area. File the excess down just to the level of the top of the original checkering and no further. A small sixty-degree bent-needle file is used from this point to re-cut the checkering. It is here that you will see why taking the time to align the checkering of both pieces before glueing them up is so important, and while you are diligently matching up the lines from both sides of the repair with your bent needle file, you will begin to notice that the repair seam is disappearing before your eyes; blending away into the checkering pattern. The same file may be used to fair-up the diamonds at the center of the grip and to clean up the fillets around borders of the checkering. This is the kind of job that can turn out as nice, or as shabby as you want it to, depending on how much time and patience you were willing to invest in the initial alignment of those two grip pieces. The final finishing steps to the outside of the grip involve "fairing-up" the borders around the checkering and any seams from the repair that occur in un-checkered areas by using a small piece of #400 wet-or-dry paper wrapped around a small rectangular eraser. Last, place a large, 2nd cut mill file on your workbench, with the file's tail facing toward you, now hold the back side of the repaired grip against the file and push the grip up the file to remove any excess Acraglas and to "level up" any slightly height differences between the repair piece and the grip. Continue this, rotating the grip with each pass until the back-side of the grip has been filed back to a perfectly flat, factory-like configuration that will (eventually) fit the revolver's grip frame.

At this point we will take the final steps in the re-fitting of our newly repaired grip to the gun's grip frame as follows: Using a small carbide burr in your Dremel or Foredom tool, enlarge the old grip locating pin hole on the reverse side of the grip until it is approximately one-quarter inch in diameter but do not make the hole any deeper than the factory hole was. Coat the grip frame, especially the area around that grip locating pin with a suitable epoxy release agent to prevent any of the epoxy we will use shortly from bonding to the steel of the revolver. Once the release agent has dried, mix up a very small batch of that black-dyed Acraglas, you may even use 5-minute epoxy with black dye for this operation, since strength is of no great import, and fill the newly enlarged grip-locating pin-hole about three quarters full with the epoxy mix, then place the grip on the revolver. The other side grip should be in place already so that you may insert the grip screw and tighten it, being very careful at this time to align your repaired grip to the grip frame perfectly *before* the screw has been snugged down. Now just let the epoxy set up, and when it has carefully remove the grip. Here you can use an old stiff bristled toothbrush to scrub away the remaining release agent from the frame and back of the grip. Turn the grip over and take one or two passes over the grip back with a large 2nd cut mill file just to remove any excess epoxy that may have squeezed out and when you replace the grips you should have a perfectly tight fitting gutta-percha grip once again.

Two-piece wood grips: Like the hard rubber grips we spoke of a bit earlier, you will also find wooden revolver grips that turn up with chips and slivers missing, and we will delve into this repair just a bit later. For now, I would like to address a very common problem we have seen with many older revolvers that have grips which are otherwise sound but have been refinished so aggressively and poorly that they have been sanded down undersized. In other words; grips that have had so much wood removed that the wooden grip edges are below or beyond the metal edges of the grip frame and they are now too small for the gun. Quite a few classic old Colt and Smith & Wesson revolvers turn up with their grips such a state. Many of these revolvers are now becoming scarce, some are historically important and

quite valuable, it is on account of this that we should be making every attempt to conserve and save what is left of those old grips. But how do you do that when they have already been sanded down way too far? Why, by using a very different method, sort of a back-door repair.

Grips that have been over-sanded are now effectively undersized in all dimensions, with the most obvious damages appearing around the edges where the wood used to fit the metal. We can restore the wood to metal fit, conserve the original wood and at the same time introduce some substance to the grips by adding wood to the *back sides* of the grips. A repair method I have used with success on many occasions is to permanently bond the back of the old grips to thin slices of new-old vintage walnut (or rosewood, as the occasion demands) that have a larger surface area than the back of the old grips, in this way the new walnut can be worked down until a perfect fit is gotten with the grip frame, then the old wood can be worked with files and sandpaper until it is blended with the old. Done correctly, the repair will leave only a thin trace-line where the two pieces of wood have been bonded. Considering that the alternative was to throw out the old grips as having been ruined, this repair method can turn out to be a very sensible step, especially when you think about the idea that we are retaining the majority of the wood from the original grips on the outside.

We begin by slicing up some new-old walnut and then milling it into small, thin boards that measure about 1/8" thick and are roughly three-inches-by-five inches; the grain direction should always run with the long dimension. Broken lever gun buttstocks or ruined old military stocks from a hundred years ago can make a wonderful source for small pieces of vintage walnut for jobs like this, and for many of the other kinds of grip and stock repairs which we will get into a bit further ahead. Prepare the original grips by first placing a sheet of #100 grit sandpaper on a sheet of plate glass which you have laid on your bench-top. Holding each grip with your fingertips by the top and bottom, carefully and gently flat-sand only the back sides of the grips. Use caution and be certain to sand the grip-backs only far enough so that you achieve a clean, flat gluing surface. In a few moments we will be gluing the backs of your grips to those 1/8" thick walnut pieces you've sawn and milled out, leaving a half inch or so of the new wood protruding out past all the grip edges. I like to use the regular Brownell's Acraglas for this, adding enough brown dye to the mixture to bring the resin to a deep chocolate color. Here's the procedure.

Before we get into the gluing, install the grips on the gun, place a thin strip of masking tape on the butt of the grip frame and another on the bottom/side of each grip. Draw a pencil line on this tape, just about on the center of the butts from side-to-side, the line should connect the two grips and cross the grip frame. Now take the grips back off the gun. On the prepared grips, plug the

grip screw holes with wax or modeling clay to keep the Acraglas out of the screw hole. Make careful note of grain direction before you place the grip on the new walnut. Lay one of the new walnut pieces out on top of a sheet of waxed paper on your bench-top and give the side of the walnut that is facing up a fairly liberal coating of the Acraglas mixture. Place the grip with its back-side facing down, onto the Acraglas coated piece of walnut, being very careful to keep the grain of the two pieces of wood going in the same direction. Clamp the grip in place and leave it to cure for at least 24 hours.

While the Acraglas is setting up there is a small chore you can attend to. Most two-piece grips are held in place by a screw but they are also "located" (prevented from moving) by a small fixed pin that protrudes out the sides of the lower portion of grip frame or grip strap. You will want to remove that pin, and preferably the pin should be pressed out of the strap in order to avoid mushrooming it with hammer and punches. Measure the pin hole and lathe-turn yourself a new pin of about the same length as the old one from appropriately

sized round stock. Size the diameter of the new pin so that it will fit through the pin hole in the grip frame fairly easily; you should be able to push it through with your fingers. Lathe-turn one end of the new pin into a point, we will call this new pin a *try-pin*. Do you see where I am going with this?

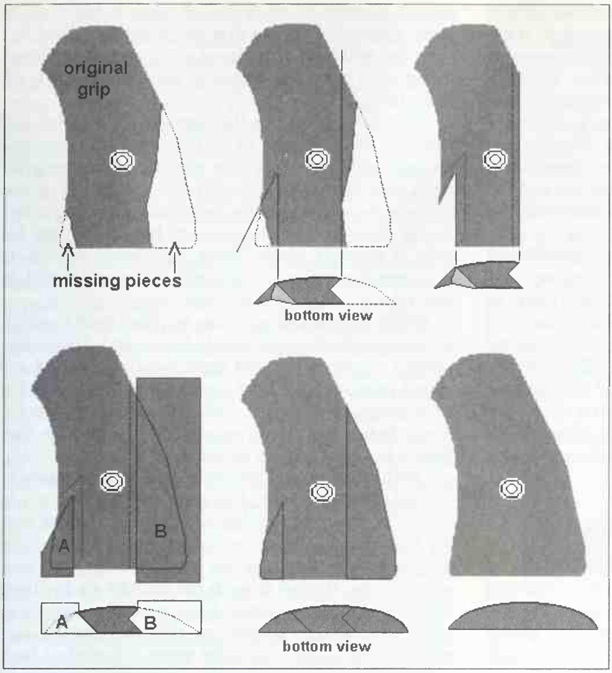
Once the repaired grips have set-up, and you have removed them from the clamp, the next step is to bring them to the thickness (front to back) of the original grips, for that critical dimension you should rely only on measurements that you have taken from an un-sanded, original pair of grips.

The repaired grips are brought to the correct thickness by block-sanding while holding them against a piece or coarse abrasive paper that is lightly glued to a hard, fixed flat surface until the desired thicknesses are achieved. Once you have the thickness taken care of, use files to carefully shape *only the tops of the grips* until you achieve a perfect fit with that area of the revolver frame. Smith & Wesson which uses a complex top-grip area, calls this area the *stock circle* and *stock shoulders*. Colt-type revolvers use two simpler flat angles. Now hold either one of the grips firmly in place on the gun and once again line up those pencil marks that you made earlier. While you are still holding the grip firmly, get hold of that *try-pin* you made earlier and push the *try-pin* through the grip locating pin hole from the opposite side of the grip frame; in this manner the *try-pin* makes a perfectly centered mark on the new grip-backing in the exact spot where you will later drill the new hole for the grip locating pin. Remove the first grip, place the other side grip on the gun, line up those pencil marks and exactly repeat the operation on this grip from the opposite side. Once both grips are center-marked you may drill the new grip locating pin holes in them using a drill press. Pay attention to the depth of those holes; you won't want to be drilling all the way through the grip! You can prevent this by setting the quill-stop so that the hole you drill is only a few thousandths-of-an-inch deeper than the length of the installed, original locating pin where it protrudes out the side of the grip frame. In the next step, you will be using another drill but that is smaller than the inside diameter of the hole through grip escutcheon on the threaded side grip to drill a new hole for the grip screw in your new grip backings, drilling from front to back. Measure the largest diameter of the grip screw, select a drill bit which is about twenty-thousandths-of-an-inch larger than that screw dimension, and enlarge *only the new screw holes* in the grip backings so that the grip screw will again pass through the grips.

Now that both grips are perfectly fitted at the tops, re-install the original grip locating pin and install the grips, with the grip screw. The overhanging backing areas around the two sides and the bottom of the grip may be rough-shaped using a small, bench mounted belt sander, but be careful not to sand so close that you make contact with the metal. Final shaping of the new backings is done with files and sandpaper backed with small flat pieces of wood until what you have achieved is a blending of the original grip contour to meet the edges of the metal. Done with care, this repair is permanent, it adds a good deal of strength to the original grip and it does what we started out to do by restoring the wood to metal fit while retaining the original wood. As far as appearance, at the worst you should see a fine line around the perimeter of the grips at the seam of the backing and the original grip. Externally, the grips may now be finished by first staining them to the desired color if either a darker shade is wanted, or if it is necessary to "blend" the old with the new wood shades, the wood is then given several coats of linseed oil or True Oil.

Wooden grip split and sliver repairs: Old revolver grips will often turn up with pieces missing completely. This is a very commonly encountered handgun malady, usually found in the form of both large and small, splits or slivers of the original wood that for various reasons are missing altogether. In these cases it will be necessary to actually replace the missing wood with new wood, and when possible, to do this in such a way that the repair is nearly invisible. For many amateurs and a few professionals, grips that have been abused like this may look difficult, if not impossible, to repair at the outset, but the fact is these sort of repairs can be made to turn out very well if only the craftsman will put some pre-repair thoughtfulness and planning into the project. There is no "set method" to use every time you have to repair missing wood in gunstocks or handgun grips. How you finally accomplish the repair will depend on the kind of break, where it is located, it's size, etc. Refer to the illustrations for a few different ideas of how these can be repaired.

Replacement of this missing wood in a professional manner really does require that you invest some thought into the process beforehand. By paying close attention for instance, to how the new wood will compare to the old in terms of density, grain structure, grain width, figure and last but not least, the color; and then making the effort to bring all of these variables together as closely as possible so that the patched or replaced area will tend to blend in more easily with its surroundings. Likewise, whenever part of a grip or stock must be replaced because pieces of the original wood are missing, it is always best to use wood of the same vintage and species, this truth applies to the repair of any older handgun grip or gunstock. As an example, you wouldn't want to neatly fit a patch of modern-grown California Claro walnut into a gunstock or revolver grip whose parent wood was a 125-year old Circassian walnut (wood which, by the way, probably came from a tree that was at least 500 years old when it was cut). Such a mismatched-patch makes me think of the Frankenstein monster; it works but it's been cobbled up from various parts and pieces with no particular order, so even though both pieces were each a type of walnut, our ill-conceived blending of the two would never pass for color,

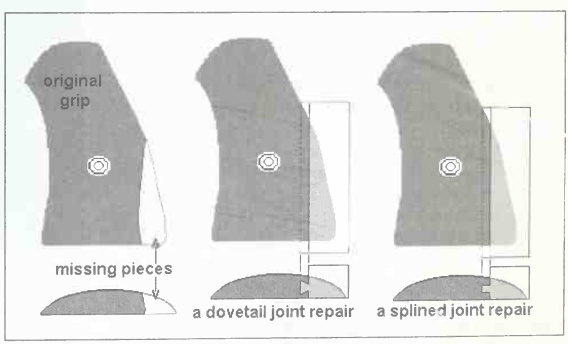


Various methods of scarf jointing in repair pieces to wooden grips with chipped toes (A) and heels (B.) The angled "scarfs" allow more surface area for the glue to adhere to, making a stringer bond. When selecting wood for the repair piece, always try to come as close as possible to the original grain pattern and direction.

grain structure or width, nor for tree species. Your "monster" would surely never look right, no matter how neat your joint work was nor what color you tried to stain it. As discussed earlier, it is for circumstances such as this that we purposely save broken gunstocks that have been scrapped from rifles and shotguns which were made in the last century, and oh, what a handy place that scrap wood bin can be!

We are talking about making major repairs to the grips here so another important topic that needs to be considered is the strength of the seam where the new wood is going to be bonded to the old, remembering all the while that what we are after is a permanent repair. The strength of this seam will have a good deal to do with the amount of internal surface area that each side of the seam presents to the other for gluing, in this case the more surface area the merrier, and this is more important than the glue itself. Wherever you are able to, after having matched the seam direction as closely as you can to the wood grain direction, as opposed to using a simple butt-joint; try making a "scarf" joint with either two 45-degree angles, or at the very least, even a long back-angle that is raked inwards will provide more surface area for gluing than a plain butt-joint could. A vertical *splined* joint can also work with success, especially in areas where the wood replacement has to be a skinny-long slivered shape. When you are patching an area of a grip or stock where there you have an abundance of working room, and if you are feeling particularly ambitious, you can fit your patch by cutting a long dovetail joint to give the seam the maximum amount of surface gluing area as well as quite a bit of inherent mechanical strength. An ideal place for the long-strong dovetail joint is the instance when a grip has been split completely in half and one of the halves is missing.

Bear in mind that whatever degree of quality you are willing to put into your joint work will profoundly define the strength of your seam as well. As a rule of thumb, the closer fitting your joint work is, the neater the seam will appear, the less glue or resin the seam will be required for a successful bond, and the stronger that bond will be. What this all boils down to is: there isn't really any single correct, or best way to repair a handgun grip. Whichever method of repair you chose to apply, there is not a substitute for good quality joint work. Remember what I said above: that tight joints require very little glue and produce



Two methods of adding large repair pieces to wood grips that offer more surface area for the adhesive to bond to than a simple butt-joint.

nearly invisible seams. On a positive note, as mentioned earlier in the part on repairing hard rubber grips, if the grips you are repairing are checkered, it is even easier to hide the repairs within the checkering pattern. In fact, a really neat repair may actually all but disappear.

Adhesives for grip repair: You have no doubt noticed that I have recommended the use of epoxy resins for all the previous repairs. There are some cases, especially where the joint was a very tight one and the seam invisible, where carpenter's wood glue would be strong enough, indeed, there are several glues available today such as crazy glue, which would have offered more strength than epoxy. Still, the epoxy was selected for two practical reasons; 1) it could be colored easily to match its surroundings and 2) these kinds of resins tend to stay somewhat pliable and this is a desirable feature whenever the object is to bond something organic which is subject to change or movement due to atmospheric conditions. An exception to the epoxy can be taken with ivory or horn, this organic material will hold best when glued using one of the new instant cyanic glues like Crazy Glue or Super Glue.

Long-Gun Stock Repairs

In this section we will look at four specific types of gun stock repairs and a bit later, the refinishing and restoration of the wood surfaces. The four kinds of damage we will deal with are cracks and splits, missing slivers of wood, the removal of dents and dark stains, and finally what to do with the stock that has been oversanded as the result of an overzealous refinisher will be the last facet of stock repair.

Cracks and splits: We begin by going after one of the most common problems; a split or crack in the wooden stock. We will define a crack or split as exactly that and no more; a damaged area that has no missing pieces of wood, of the sort that if the split wood could be forced back together tightly, you might not even be aware there had ever been a crack. Splits or cracks like this will normally occur around the tangs, around and about the wrist area, although they may also be seen on the flat side area of box-lock shotguns and frequently at the toe or heel area of buttplates in rifles or shotguns. Before we try to repair a crack or a split, we should be asking: Why is the stock cracked? Cracks or splits don't always have the same cause and may they well have occurred for various reasons or even a combination of reasons. Sometimes it's a simple case of very tight wood-to-metal inletting and wood that has shrunken (the wood shrinks but the metal can't shrink . . . so the wood gives way), sometimes the fastener that holds the stock onto the action may have come loose and as the gun was carried and fired the movement allowed by that loose fastener could have caused the stock to split. In other cases the gun may have been dropped, so the split could have occurred either upon direct impact, or indirectly in sympathy with the impact. The truth is, in almost all cases where a split or crack is found on an older gunstock; the fact that the wood has dried and shrunken will have also played some part, even though it may have been a small one in the cause of the crack being there.

Why did I point out that last bit about dried and shrunken wood helping to cause a stock split? So you, the gunsmith don't make the mistake of clamping the stock back together to the exact size and position it was in when it was new, having done nothing to compensate for the shrinkage which caused or helped to cause the split in the first place. Doing that would effectively guarantee that this stock will split again, and it will do this right next to your new repair.

Before the cracked stock can be glued back together, the area inside the crack should be cleaned. This is certainly a requirement if the crack has been opened and closed over a long a long time so that debris and dirt have gotten into it. You will first carefully open the crack slightly, very gently spreading it open with your fingers but only enough to expose the inside for a liquid-flush cleaning, and then holding it open by means of a small wooden wedge. Use great caution here not to spread the crack so far that you cause it to break out! We like to manually get in there with a small wooden toothpick to remove any obvious solid dirt, and then pour rubbing alcohol through the cracked area to flush out most of the loose debris. Once you have managed to get all the foreign matter out, then the cracked area should close up nice and tight when it is pushed back together. After the alcohol bath, try spreading the crack open just a bit and allow the wood inside the cracked spot to air dry overnight.

When bonding cracked stocks back together it is a good idea to use a bonding agent which is liquid enough to flow throughout the entire crack, thus offering the maximum amount of surface area for a strong bond. I like to use an epoxy because these adhesives tend to

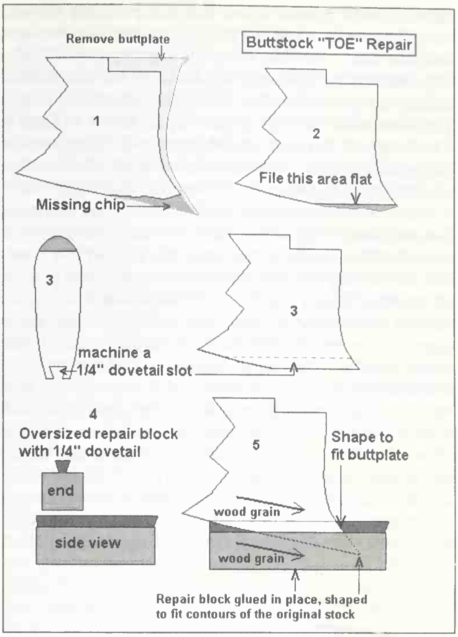
Brownells Acraglas Gel is an excellent epoxy adhesive for making repairs in stocks or grips when a strong bond is needed to hold patches of new material, particularly where a filler is required to close gaps. The product may also be dyed to match a particular color application. When a more "liquid" epoxy is desired, the original Brownells Acraglas would be more appropriate. Author photo.

stay somewhat more flexible than common carpenter's wood glues which can harden up to be very brittle. The desire to have an easy flowing, more liquid glue excludes using thick epoxy products like Acraglas Gel. On account of its liquidity, Brownells original Acraglas makes a very good choice for this job, particularly if the gluing is done on a hot day.

To apply the Acraglas, hold the cracked area open as before with a small wooden wedge, before pouring the mixed Acraglas into the cracked area. Heat this area of the stock up with a hair dryer set on "high" until it feels warm, but not so hot that it becomes too hot to touch. Heating the stock up beforehand will allow the Acraglas to really flow deeply, not only into the crack but also into the pores of the wood to offer a terrific bond. Now pour the Acraglas into the crack from the widest point, allowing the epoxy to flow downhill into the crotch of the crack. If necessary, employ an ice cream stick to help force the epoxy into the farthest, tiniest crevice. Remove your wedge and push the cracked area together, wipe off excess Acraglas with a rag and wrap the area with waxed paper, then tightly tape the waxed paper shut with a piece of masking tape. We are using waxed paper since the epoxy won't bond very well to this paper and it will be relatively easy to remove after the Acraglas sets up. Finally, most stock cracks are in areas that will not lend themselves to being clamped with conventional "C" type clamps or wood clamps. We prefer to clamp almost all repairs of this sort by using ultra-strong "surgical tubing" which is wrapped completely around the affected area. Surgical rubber tubing is available at most hardware or woodworking stores in several thicknesses, this clamping method offers the opportunity of clamping wood of almost any irregular shape with 360 degrees of pressure in such a way that the wood cannot be marred.

One the Acraglas has set up hard, or after about 24 hours, the rubber clamp may be removed and the taped, waxed paper stripped off. Any remaining excess Acraglas on the exterior of the stock may be scraped off with a razor blade and then final-sanded until it blends with the surrounding wood. If the crack had been cleaned well and then clamped successfully, all you will notice is a tiny line of Acraglas where the crack used to be. Be sure you check any areas where the wood meets the metal if the repair was in a tang or other metal-to-wood area and clean out any excess Acraglas that may have seeped out of the crack and into inletted areas where it could interfere with the re-assembly of the gun.

Missing slivers of wood: We will often encounter a long gun stock with a missing piece of wood, especially when the weapon is older and after being used in the field for countless hunting seasons. The most common area where we will see wood chipped or broken out is at the toe of the stock (the lowest and rear-most point) just behind the buttplate. The repair for this sort of damage is not as difficult as it might seem, only requiring some patience, a little thought and a small block of walnut

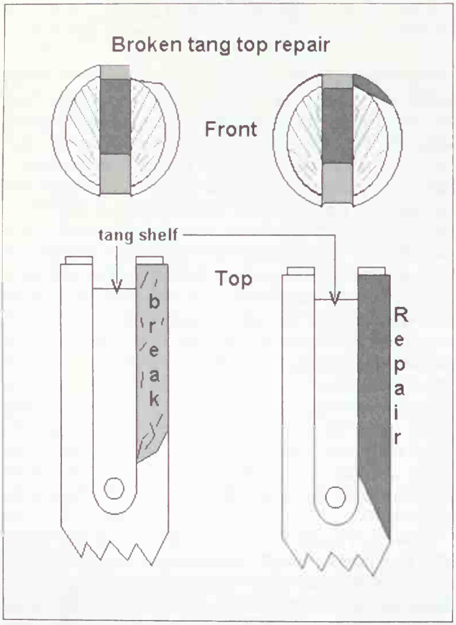


that you have scrounged from a scrapped out stock that came off a similar old firearm. As you will note from the illustration, the buttplate is first removed and the damaged area is filed down to remove all damages and so it will form a flat, table-like surface at the bottom of the stock. Long-wise down the center of the stock; saw and then file finish a small, one-quarter-inch wide dovetail slot, or even better yet machine the dovetail with your router. This dovetail slot will accept the dovetail from the repair piece you will make from the scrap gunstock. Place the buttplate back on the stock temporarily and measure out the approximate size of the wood repair block that you will need to fill this area (see 5 in the illustration), remembering to include the height of the dovetail which you have cut into the stock, and be generous leaving yourself plenty of excess wood in the repair block. Be alert to the importance of keeping the grain type, and most important grain direction of the stock and the repair block identical. The closer you are able to match the grain direction, the less visible the repair will be.

Saw out a repair block to suit the size of this repair, plus one-inch of length on each end (two-inches total extra length) and three-quarters-of-an-inch of extra depth (height.) Remember what we said about grain direction, your repair block will be sawn out so it's flat top (the part that will match with the bottom of the stock) is cut a slight angle so the grain direction will

mate. Surface the flat top so that it is perfectly flat and machine or saw out a dovetail tenon and fit this tenon and the flats at its bottom so the repair piece will slip into place in the gunstock as shown in the illustration. Take your time with this fitting procedure and it will pay dividends later. Once your repair block is fitted it can be glued in place on the stock with a mixture of Acraglas Gel that has been colored with a brown dye and left to harden with an inch overhanging each end.

After waiting about 24 hours, or until the Acraglas has hardened completely, carefully saw away most of the excess overhang in the buttplate area with a band-saw or a coping saw, and finish shaping that rear portion of the repair block into the contours of the buttplate by using a belt sander or rasps, then finally files and sand-paper. If the repair block is so large that a new lower screw hole for the buttplate has to be drilled, now is the when that hole can be marked and bored into the new wood, so the buttplate can be re-installed with both screws. Your next step will be to carefully saw away the excess wood from the bottom side of the repair block, using caution not to saw too deeply, you should leave about one-eighth-of-an-inch of the new wood remaining below the line of the old stock. From here on it is simply a matter of using rasps, then files and finally a sanding block to final shape the repair block and blend it so it matches the original stock and buttplate contours.



A sample of how you may repair a broken stock that has missing pieces of wood in the area of wood-metal fit at the tangs.

The same or similar methods may be applied to other areas of the stock where pieces of wood are missing. A good example of this would be Winchester lever guns where they are often missing slivers of walnut around the tangs. This kind of repair is more intricate and takes more time and patience than the toe of the butt repair above, but with careful matching and close joint work, an almost invisible repair is possible.

The removal of dents and dark stains: Wood that is dented means that probably due to impact damage, a small area of the stock has had its fibers compressed more densely than the fibers of wood surrounding it. Sometimes the dents can be so deep that in order to sand them out we would have to remove more wood from the surrounding areas than would be prudent. There is another answer, dents in the wood, even though they might be fairly deep may usually be removed by using a process known appropriately as "steaming" and boning. Likewise, unsightly areas of the stock that have been darkly stained from an excess of old oils or solvents may often be lightened using the same methods.

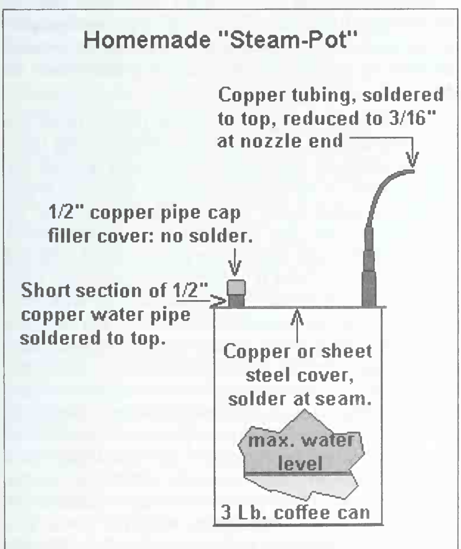
Steaming simply means that a small, concentrated stream of steam is directed at the dent and the area immediately surrounding it. Given enough time, the steam softens the wood fibers, allowing them to decompress and "raise" back up to their former level. Boning involves drawing a smooth, hard object like a polished hard-maple dowel over the affected wooden area while pushing down very hard (back in "the day", they used smooth, dry animal bones for this procedure) with the grain, to draw the wood fibers together. Coupled with the steaming, boning forces the moisture through the fibers so well that the process can even out and smooth a dented or damaged area so well that the damages may virtually vanish.

Steaming out dents is usually done while the stock is being refinished, and if that were the case it would be prudent to strip the stock of all old finishes and oils beforehand. However the steaming/boning process can also be performed when there is not a desire to refinish the wood. Here is how the process works:

The dented area, and this should include an area encompassing approximately one inch all the way around the dent, is soaked with hot moisture from the steam. After a few minutes the moisture and heat of the steam so softens the compressed fibers of the dent that they begin to rise, to un-compress as the dent begins to disappear. You may also notice darker fluids leaching out of the compressed fibers of the dent, these are old oils and perhaps varnishes cleansing out of the wood by the action of the steam, this is normal and they should be wiped away with a clean cloth. At this point the steam is removed from the dent and the entire area is "boned" as you push down hard and draw the polished hard-maple dowel over the dented part of the stock, in the direction of the grain, each time slightly overlapping

your previous pass. You will notice after you have drawn the dowel over the area, that the raised grain is smoothed out somewhat and that even more of the dent has begun to disappear as a result of the boning. By repeating the applications of steam for 2-3 minutes, followed again by boning, you will eventually remove the dent so far that the area will be leveled with its surroundings and probably showing only the slightest blemish of discoloration where the damage once was.

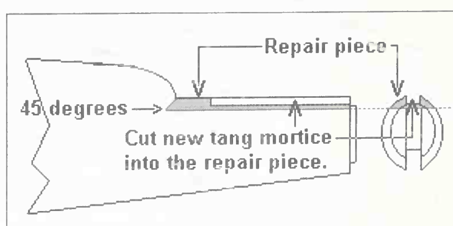
Steam sources. One method of steaming is to build a steam-pot that will sit on a hot-plate, similar to the one shown in the drawing, this has a nozzle made of small diameter copper tubing which you may hold the stock over while directing the stream of steam onto the affected area. Another way is to use an electric iron, but I strongly recommend that you purchase your own iron for this work and that you not take the liberty of borrowing the wife's! To use the iron, mount the stock firm, either on a bench top or in a padded vise with the dented area facing up. Cut up an old cotton t-shirt into squares about six by six inches and fold one of the squares several times, forming a square about two-by-two inches and soak this folded cotton in clean water. Heat the area of the dent with a hair dryer (once again, my best advise would be to purchase your own hair dryer for the shop) until you can barely touch it and apply the wetted cotton like a compress, onto which you will press the hot iron which you have set to the "steam" setting and press down hard. Hold the iron there for several minutes, until steam begins to freely flow from beneath the wetted cotton compress. Whether you are using a steam-pot or an ironed-cotton compress, follow the method given earlier and you will successfully steam out the dented area.



The same method is applied to the removal of deep-dark stains that were caused by oil and solvents and to a lesser degree the lightening of stains caused by rusting iron. The difference for using this method to remove stains is that the wood would have to be previously stripped of all old finishes, oils and varnish before steaming. Otherwise exactly the same methods will be used. For really dark and stubborn stains that seem to be resisting all of your steaming efforts, try swabbing the dark area with a light coat of regular liquid bleach with a shop swab, wait a few minutes and then re-steam and bone the area. Unless the stain is from rust, which can cause a particularly bad dark spot, about ninety percent of the time this method will lighten it.

Over-sanded stocks: Just as with handgun grips, rifle and shotgun stocks will sometimes be encountered that have been refinished previously and perhaps over-sanded; so that the wood is cut down to where it is under the level of the edges of the metal that it should be covering. When that happens it can make for a combination that looks atrocious, indeed in most cases it will be much simpler and less expensive to replace the wood. There are exceptions to that rule, instances when the gun has such an intrinsic value that it will be more desirable if we try and keep the original wood with the gun, almost no matter what that entails. In those cases we are forced to come up with some more creative ways to repair and conserve the stock.

Over-sanding around the action tangs can be handled by machining down the tang area to just below the level of the tang "floor" in the stock, then gluing in a repair piece like the one shown in the illustration. Closely matched repair pieces as we mentioned earlier, can be cut from an old scrap gunstock from the same sort and vintage of weapon. You will note that the rear of the repair piece should be scarfed into a 45-degree cut which you may machine or file into the stock. After epoxying the repair piece in place, you may shape the outside to match the contours of the original stock, remembering to leave enough material so the repair



When the stock has been sanded down under the level of the metal it is sometimes possible to neatly "scarf" in a patch of closely matched walnut. Expending this kind of effort would only be practical if there is a strong desire to keep the original stock with the gun.

piece remains above the level of the metal tang. Now that you have the repair piece roughly shaped to the stock contours, all that remains is for you to inlet the tang into this new piece of wood. This same sort of repair may be applied to the lower tang, by just flipping the process upside down. The butt of the stock is usually handled somewhat differently since such a large repair piece would look unsightly. In this instance, where the buttstock is over-sanded at the buttplate, it will normally make a more effective repair if we simply surface the buttplate edges to bring them down to the level of the wood.

An easy refinish for old gunstocks; with oil

Many gunstocks and handgun grips out there have real beauty that is hidden underneath years of dents, mars and scratches. Sometimes old finishes just *feel* old and good, it's a sense, a feeling so the collector must then determine whether or not to refinish the old wood. Make no mistake, just as we alluded to in the section of restoration, there is some wood that should not be touched. You wouldn't ever want to detract from the value of a firearm by destroying its original integrity, and this is often determined by the overall condition of the gun, the market value, and what you paid for it to begin with. Very often a gun handed down in the family is one that people prefer to have preserved and kept pretty for future generations, regardless of any monetary value. If you have decided the wood should be refinished, and are positive you want to do the work yourself, here are some thoughts to help you learn the art of refinishing wood, professionally and competently. There are wood refinishing kits that you can buy, but we prefer to refinish the old fashioned way. It takes more time, but the end result is markedly more professional.

As to required supplies, this is pretty basic stuff. You will need two rubber erasers (one which is approximately 2 1/2" long, 3/4 "wide, the second one about half that size), 100 and 220 grit sandpaper (cut in squares just big enough to wrap around the eraser), #0000 fine steel wool, Birch Wood Casey Tru-Oil, single edged razor blades, boiled linseed oil, pure spirits of gum turpentine, 2 medium toothbrushes, small dental picks, lint-free tack rags, perhaps a tea kettle (for steaming out dents), a hair dryer, a small piece of "dowel", a roll of masking tape . . . and most important, patience. If you are in a hurry before you have even begun, stop now before you start because rushing won't get you anything good here. Start by examining the wood carefully, noting the wood-to-metal fits where any major damages are as you disassemble the gun. If there are damaged areas at wood-to-metal fits (see the part of stock repairs for some great repair hints), these will have to be addressed sooner rather than later. Never try to refinish the wood while it is on the gun itself.

Clean areas of checkering (using a coarse cut, 60-degree bent-triangle file), as well as any markings first. Using an old dental pick, remove any old build-up in the crevices of the markings and checkering. Be gentle here, these can be weak spots which a sharp edge will carve out very quickly. After you have cleaned all the heavy varnish and greases out of the checkering, we do not do any sanding in this checkered area at all, instead take a stiff old toothbrush which has been moistened with Hoppe's #9 powder solvent, or alcohol. Vigorously scrub the surfaces along the lines of checkering. Blot it out every so often with a lint-free cloth. (In some cases, you may want to let the solvent set overnight to dissolve very heavy deposits and brush it clean the next day.) When that is completed, dry the area and cover it over with masking tape to prevent sanding it by mistake while you are attacking the larger areas of the wood. This area will be blended to match the rest of the stock later, during the final steps.

Now we will remove the top layers of the old finish by scraping. Holding the single edge industrial razor blade at almost 90-degrees to the wood's surface (nearly straight up and down but lean the blade slightly toward the direction you are going to pull it), gently scrape the old finish off the stock by pulling the blade toward you, moving always in the direction of the wood's grain. Be mindful never to tilt the blade very much or you will gouge the wood. Take care around the edges of the stock where there are wood-to-metal fits if you have not taped them and don't ever push down hard on any edge area. Maintaining the wood-to-metal fit is absolutely vital to a successful restoration. Don't bother to attempt to scrape the old oil or varnish out of the little dents in the wood with the razor. These will begin to disappear as you sand, and most of the deep dents can be steamed out later on in the process. (Also, see the section on stock repairs.)

After you are sure the majority of the old finish has been removed, and the wood looks uniform, begin sanding by wrapping the 100-grit sandpaper around the wide, flat side of the larger eraser (use the small eraser for hard-to-reach areas). These sandpapers will fill up with gunk quickly and should be replaced often, don't keep sanding when you see the grit has filled with old varnish or oil . . . toss it sooner rather than later. Hold the wood firmly in one hand while sanding with your other. To avoid cracking this old wood, do not press the stock down on a work bench, or your knees, while applying pressure. Do not sand all the way out to the edges of the wood where it fits the metal (you will very lightly sand these areas just before you begin the oiling, later in the process.) And never press down hard when you are working near the edges, this could result in a broken or cracked piece, especially where the wood is hollowed out to fit over part of the receiver. Make deliberate strokes and always follow *with* the grain. The eraser will enable you to make straight strokes, although

it is pliable enough to follow the contours of the stock. Never sand against the grain.

When the wood has been completely stripped, so that no more old finish comes off on the #100-grit sandpaper we can try removing some of the dents and dings. Hold that area of the stock which is still marred over a steaming tea kettle spout (you might want to make sure its whistle is broken or removed beforehand.) Trying to use an open pot of boiling water for this would not only scald you, but will steam wider areas of the wood which should not be exposed to excess moisture. Our aim is to direct a small, strong spout of steam right against the dented area. After you have steamed the area for a few minutes, use a hair dryer set of "high" to dry off the wet area more rapidly. You will begin to notice the rise of the grain, the dent will begin to get smaller the more you steam it because you are softening the wood fibers around it and that allows its bottom to raise back up where it naturally wants to be; toward the surface. Repeat the steaming process several times if necessary until you have that dent up very close to the surface. Try to steam all your dented area in the same day and when you have finished, do not re-sand right away, hang the stock up from a piece of copper wire in a dry part of the house so it can thoroughly dry for at least 3 days.

When it has dried you can also try the old boning trick, that is rub a rounded piece of hardwood dowel stick against the surface of the wood (with the grain and push hard) where you have steamed. In the old days this was called boning because literally a dried, polished animal bone was used instead of a wooden dowel. There will be times that the wood will not *heal*, in other words the dent is so very deep, or else some wood may be missing from the dent, in that case you might have to live with what remains after steaming. You next step is to start sanding again, take the #100-grit sandpaper wrapped on the eraser and go over those rough spots where you have steamed the wood very carefully, you don't want to wear hollows in the stock. Once you have "blended" the steamed areas with #100, again sand the wood uniformly but this time switch to #220 sandpaper until the exposed wood is smooth. We use a tack cloth periodically to dust off the wood, and with my eyes closed, feel the texture. The eyes and shadows can be deceiving where fingertips often will 'see' any roughness or places you might have left out.

When the wood is all cleaned and sanded perfectly with the #220 paper, remove the masking tape which was placed over the markings and checkering. You will want to lightly blend the areas around them right up to the edges of these areas. *Carefully* sand up to them with the #220 sandpaper. This will make the surface appear much more uniform in texture and color. Then gently sand along the wood where the metal will be placed into the stock. Be very careful not to remove so much wood that you destroy the wood-metal fit. While you are doing these touchy areas, it's a good practice to keep fitting the metal onto the wood every so often just to be certain you are not sanding too much off.

We'll assume that your stock is ready for a finish. Do not automatically assume that you will need to stain the wood. Oil will darken it naturally right away as soon as it is applied and still more over time. In fact, unless you are making a repair or matching a forearm or grip, I don't recommend it. Wipe off the wood with a clean, lint-free tack rag to remove any sanding residue. If the grain appears to be too "open" then we should do something about filling the grain before we start to apply any finish, if we don't the open grain will just keep on soaking up huge amounts of the oil finish. Such open grains will not present a good finished look unless they are filled and we would be just wasting our time and oil. Years ago when I worked in the marine industry I got to learn a lot about finishing and filling open grained hardwoods. One thing I learned there was that the old, linseed oil based marine wood fillers work outstandingly well compared to anything else I have tried since. These fillers are of semi-liquid form and come in many shades and colors, including clear. If you have elected to fill the grain, and a darker color is desired, then a brown mahogany color is an excellent choice and produces a rich, dark 19th century walnut look. These fillers are rubbed onto the bare clean wood with a cloth and *across the grain* which will produce what looks for the world like an utter mess. Pay no attention to how terrible it looks, you haven't ruined anything. Depending on the manufacturers instructions, the filler-stain is left to sit from a few hours to two days at which time it is rubbed off with a cotton cloth, also *across the grain*. Check to see that all the grain is well filled and if it isn't, repeat the process until it is. The next step after the grain is filled is a quick and very light sanding *with the grain*, using fresh-sharp #220 sandpaper and then wipe it all clean with your tack cloth.

Lay the stock on a clean surface, preferably newspaper. If you lay it on a wooden surface you might scratch it. Wash your hands, this will prevent any residue on your hands from becoming involved with the oiling process. Dip the tip of your finger into the Tru-Oil and begin to rub it into the surface. Try not to make the mistake of rushing this process. If you over-apply oil, it will lead to a build-up which will make removing it more tedious and less even. I prefer to use only one hand for oiling in order to avoid the wood from slipping onto the floor or workbench. You don't want a dent now after all that work. Continue along the whole piece until it is coated completely, *except* for the checkering area. Never put the Tru-Oil in the checkering, you don't want to create a build-up in there after working so hard to clean the checkering earlier. It will begin to dry as you are rubbing, so I recommend coating the entire stock without stopping. When it begins to feel tacky this step is finished, and your first coat has been applied.

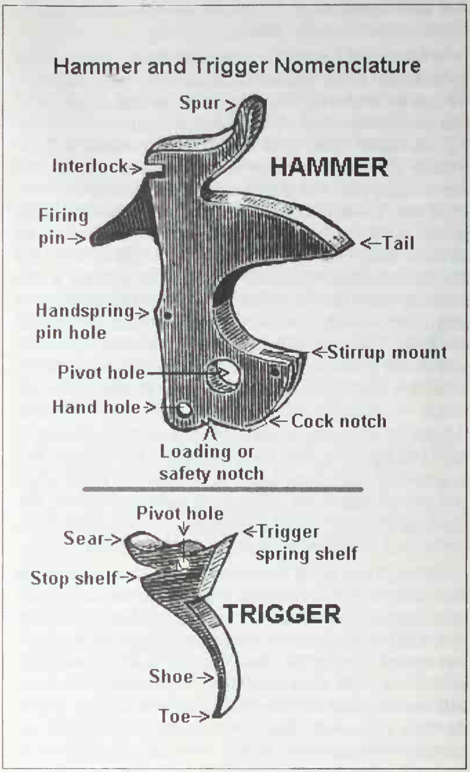
This process usually needs to repeated five or six times. Depending on the desired finish, you may want to

repeat the process still more times. Do not lay the work-in-progress down. Dirt or metal filings from your work area will readily stick to your oiled wood and if you place it on the workbench it may get scratched. Instead, use an opened-up wire coat hanger, or light duty bailing wire, and pull it through the receiver opening, or some other available screw hole. (You may have to insert one of the wood screws temporarily, and wrap the wire hanger around the screw in order to hang the stock.) Snake the wire through in such a way as to curl the wire back into the wood, on the underside of the butt or in the tang area, which has not been refinished. Then hang the wood from a pipe, or somewhere high in an out-of-the way corner where it won't get bumped. Give a tug to make sure it is securely hung, and leave it alone for a day; two if you are in a high humidity area. You will need to use paint thinner to break down the Tru-Oil and get it off your hands.

After the Tru-oil is thoroughly dried, take one half of a steel wool pad and vigorously rub the surface with the grain. You will only get that first coat of oil off by rubbing hard. The wood's surface should look completely even, and dull. Wipe the entire area clean with a lint free cloth and then wash your hands to remove any steel wool filings before you apply the next coat of oil.

Repeat this entire process again the following day. The wood will look dull until you have repeated this process several times. After 5-7 coats, you will begin to notice a lovely luster beginning to appear. After you have steel wool scrubbed the final coat, the wood can be polished somewhat brighter by hand, using an old cotton t-shirt and, just a bit more elbow grease.

Now for the checkered areas, remove the tape. Using a medium toothbrush, dab a 50/50 mix of Linseed oil and gum turpentine on the surface of the bristles. Brush this mixture into the checkering area and hand-rub any excess right into the surfaces of the wood which you have just finished with Tru-oil. When it is completely rubbed into the checkering, press a clean, lint free cloth over the checkering to wipe off any excess. You may repeat this once more to achieve the final results. Let air dry for several days. After you have carefully re-assembled the gun you should be delighted at how nice it looks. A special note concerning linseed oil soaked rags: Linseed oil soaked rags have a tendency to spontaneously combust! Do not keep these rags laying around your shop and do not leave them were there is no air circulating. The day you are finished with them, discard them and get the garbage they are with outdoors in the open air before collection.



This illustration showing the names of the parts of a Smith & Wesson New Model Number 3 hammer and trigger is representative of the basic types of simple trigger mechanisms that were used in many 19th century firearms, whether rifle, pistol or shotgun.

General rules for hammers and triggers

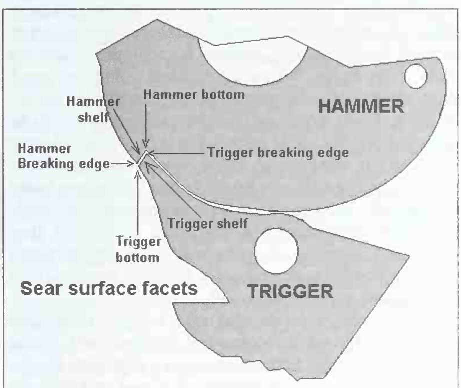
Sear engagement: Sear engagements are similar with most all firearms designs, that's especially true of those 19th century arms with exposed hammers. The contact between the hammer's notch and the trigger's sear that holds the hammer at "full cock" (ready to fire) is what is known as 'sear-engagement'. In simple terms; the factory has machined a notch into the hammer at the full cock position that is supposed to exactly match the shape of the trigger's machined sear tip. Whether or not a trigger sear engagement is safe and reliable will depend on the shapes and the angles at which the hammer notch and the trigger sear are machined, and whether they have been matched as closely as possible.

Achievement of this correct sear engagement, along with the removal of any "lost motion" within the mechanism makes up what is normally called a 'trigger job'. Factory hammer notches should never be altered by any means nor in any manner, the only exception being a small 'squaring operation' which would only involve the removal of burrs. Unless those hammer notches

have already been damaged or altered (in which case the hammer should be replaced with a new-factory part), any and all fitting work in the searing areas should be performed only on the trigger sear which is shaped slowly, and carefully to mate with the hammer notch.

What weight? You are (or should be) out to achieve a safe, consistent and clean breaking trigger pull whose let-off weight falls within the area of four to five pounds, and one with as little 'creep' as possible. To this end, any work you may have already performed in your efforts to eliminate "lost motion" in the pivots of the hammer and the trigger will surely ease the job ahead, so if you haven't already done so, by all means take the steps now to remove all lost motion at the pivots of both these critical parts. The achievement of that 'clean trigger break' and removing the 'creep' will both be affected by the shape of the trigger sear. Sometimes shooters will ask you for a three or even a two-pound or less trigger pull, but in spite of temptations to the contrary I would strongly suggest that you adhere to a trigger pull in the four-to-five pound area.

Hard experience has taught me that very light triggers on firearms of this type can be an "accident just waiting to happen", and I say that without regard to the competency of the shooter. Remember too that many of these weapons rely on very heavy mainspring tension in order to work properly, couple that heavy spring with some rough and tumble against a clock and you have a situation that could spell real trouble. One of the true gurus of Cowboy Action Shooting, Charly Gullett, also strongly recommends a four-to-five pound pull, especially if the revolver will ever be used in the bumps and grinds of mounted shooting events. As Charly says: *"In the case of mounted shooting, 3 lbs. on any trigger is entirely too light for hard riding" and "I personally prefer the feel of a cleanly breaking four (4) to-five (5) pound trigger (even in the pedestrian matches)"*. This author is in strong agreement but would expand the definition to guns used in all types of cowboy shooting matches.



Here the drawing shows the parts or "facets" of the sears on both hammer and trigger. Although the drawing illustrates the hammer and trigger from a single action revolver, these principles have a more universal application.

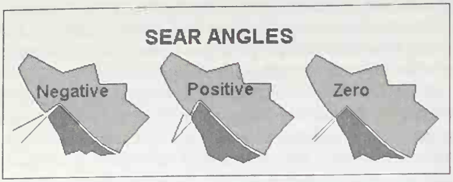
Sear facets: Let's have a close look at the shape of the top surface of the trigger's sear area. Factory new trigger sears will normally have a flat, squared shape here. The correct trigger sear will have three active facets, or surfaces; the shelf, the breaking edge or 'top', and the bottom. Those three trigger sear facets need to correspond or mate with their mirror image surfaces on the hammer's cock-notch. Trigger "creep" would be the distance that the breaking edge of the trigger's sear has got to travel along the shelf of the hammer in order for it to reach the breaking edge of the hammer notch so it can release the hammer. Break, or let-off is that point where the breaking edge of the trigger has reached the breaking edge of the hammer shelf and at this point it allows the hammer to fall. Ideally both breaking edges should be perfectly square and as sharp as little knife blades.

Terms of engagement: The terms negative, positive and zeroed engagement are used to describe the relationships of the angles of contact between the trigger's sear and the hammer's cock-notch. These *terms of engagement* offer descriptions that are based on the angle of these sear cuts relative to the center of the pivot point of the hammer.

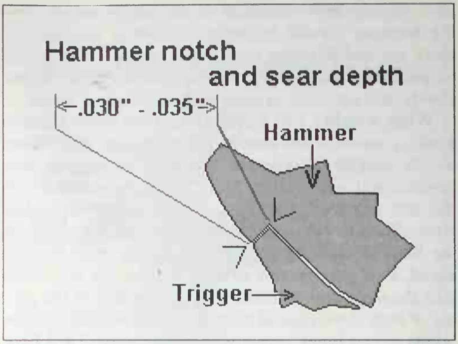
Negative sear engagement: This leaves the trigger shelf at an angle from which the trigger sear might very easily disengage. You can see in the illustration that this angle is pointing off toward the rear of the hammer's pivot center. This gun's trigger pull will be *extra light* with its negative sear engagement, and may very well be considered dangerously unsafe. In such a situation the hammer might not hold at full-cock, it could fall of its own accord if the weapon is bumped. The condition will also cause the breaking edges of both hammer and trigger to wear at an abnormal rate and that will further increase the chances of an accidental discharge. A gunsmith should never, under any circumstance leave a negative sear angle in any firearm.

A zeroed sear engagement is one that offers a trigger sear and hammer notch that are perfectly squared, and parallel with one another. This angle of engagement will generally produce a good to very good trigger pull, and one with a much higher degree of safety than one with a negative sear angle.

The positive sear engagement is the exact opposite of the negative angle, it's one that occurs when the hammer notch shelf angle is actually angled toward the front of the hammer's pivot center. What happens with a positive sear angle when the trigger is pulled is the trigger sear's breaking edge actually lifts the hammer up, and in so doing it has to overcome the full tension of the mainspring in order for it to move through the positive sear angle and then reach the hammer's breaking edge. Positive sear angles are the safest, but they also produce



What the negative, positive and zeroed sear angles look like.



Hammer notch depth and trigger sear depth should approximate each other at roughly thirty to thirty-five-thousandths-of-an-inch depth each. The deeper the hammer notch, the greater amount of creep that is likely to be felt in the trigger pull.

the hardest trigger pulls, and you will easily understand why this is by examining the illustration. A factory-perfect trigger sear engagement is one with roughly +2 to +3 degrees of positive angle, this will leave a crisp and reasonably light let-off while at the same time affording an extremely solid and safe sear engagement. As this positive angle is increased past let's say +5 or even +10 degrees, the amount of effort required to overcome the 'over-engagement' becomes more than what would be called acceptable for any serious shooter, leaving an overly hard trigger "white knuckles" pull that will not allow the shooter to produce good accuracy with this weapon.

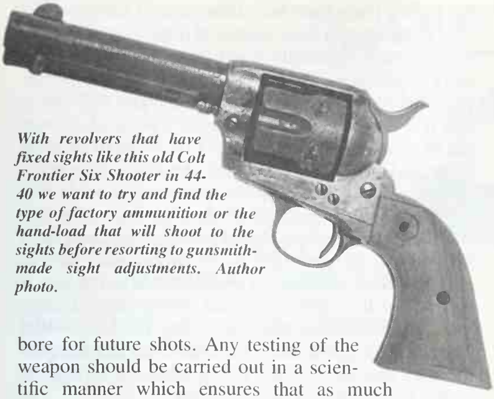
Trigger sear and hammer notch depth: The depth from its top to the bottom of the hammer cock-notch should be at the bare minimum of at least twenty five thousandths of an inch in order for it to hold well, and to keep a safe trigger sear engagement. A depth of from thirty to thirty-five-thousandths-of-an-inch is even more preferable. You will find the depth (thickness front to rear) of most factory trigger sears to be from about thirty-five to forty-thousandths or more deep. If you have one that has been filed down already to a depth that is less than about, say twenty-five-thousandths; such a trigger is weakened in structure and has been thinned to the point where it will probably have excessive creep; you should consider discarding it and replace it with a factory new trigger.

Re-hardening a trigger sear: After you have worked on the trigger's sear and it has been carefully shaped and honed so that you've achieved the desired safe and crisp pull, if you find you have removed metal from the trigger sear area during the process then you have exposed the softer metal under the surface of the sear. In that case the trigger's sear area should be re-hardened to guard against future wear, and so that your nice, new pull will stay the way you set it. We normally reharden these by bringing the sear area to a critical temperature (about cherry red) with a neutral gas flame and quickly quenching the entire trigger in 10-W-30 Mobil 1® motor oil. This process will leave the sear area brittle and a bit too hard for our purposes so we will need to *draw the temper.* Tempering actually softens the hardened area slightly, removing just enough of the brittleness to prevent the part from shattering like glass while leaving the hard outer shell that will guard against wear. You may temper the sear by slowly heating it (this means bringing it up to temperature slowly) over a gas Bunsen type burner to about 460 degrees Fahrenheit, or until a deep straw color[8] is observed, then remove the part from the heat source and allow it to cool slowly.

Sight thoughts

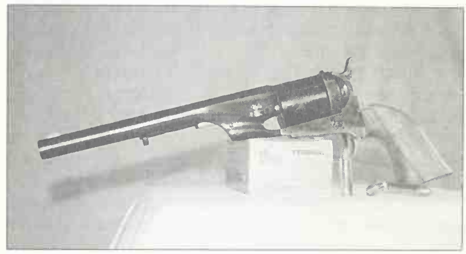
Over the last 25 years we have had many handguns and rifles come through the shop where the owner's complaint was one of poor accuracy, of inconsistent accuracy, or, with fixed-sighted handguns the revolver would not shoot to its sights. We hear this latter complaint much more often since the growth in popularity of cowboy shooting. Many times the weapon will prove out to be otherwise mechanically perfect, but it might have a worn out, faulty or bent barrel. Other times weapons will be found to be not only mechanically fine, but when tested scientifically, have proved to be very accurate. Seemingly groundless complaints like this occur more often than you might imagine, and the source of the shooter's dilemma is frequently traceable back to his choice of ammunition, or perhaps the lack of choice.

When accuracy is the issue, after we have eliminated any possibility of a mechanical problem and laying aside such basic human error as improper trigger squeeze, grip and sight picture, if a gun still will not shoot accurately, its problem may very well be the kind ammunition it is being fed. First and foremost, when you test any weapon for accuracy always start out with a clean, dry bore and fire one prep-shot to stabilize the



With revolvers that have fixed sights like this old Colt Frontier Six Shooter in 44-40 we want to try and find the type of factory ammunition or the hand-load that will shoot to the sights before resorting to gunsmith-made sight adjustments. Author photo.

Several different brands and bullet weights of factory ammunition were tried before this accurate load, which also shot almost perfectly "to the sights" was settled on.



This Navy Arms replica of the 1861 Colt conversion in .38 Special is the gun that shot the group above. When fired with 148 grain wadcutter ammo the group sizes averaged three-and-a-half inches in diameter, they were also four-inches low and left, illustrating what a difference ammunition can make. Revolver courtesy Navy Arms. Bullet 'N Press photo.

bore for future shots. Any testing of the weapon should be carried out in a scientific manner which ensures that as much human-error as possible has been removed from the test procedure, like in the prone position with a sand-bag rest, from a bench with a sand-bag support, or best yet from a machine rest.

The point of impact and group size on the target can certainly be affected by various types of ammunition (differing bullet weights, shapes, diameters, powder charges and primers.) Doesn't it make sense then to try the gun with several different brands of factory ammunition, exploring also the various bullet weights offered by ammo makers in off-the-shelf cartridges? Should you hand-load your own ammunition you, of course, have the unique ability to custom-tailor an accurate load for your specific weapon as long as you are willing to put in the time and effort this will entail. During the testing, you will probably find that the weapon is more accurate with one brand of ammo or one specific bullet weight than it had been with what you had been using. Sometimes the difference in accuracy can be alarming, often it will be but slight, here is where hand-loading your own ammunition can really pay off, in the opportunity to fine-tune the ammunition to your specific firearm.

The situation can be different for a fixed-sighted handgun that refuses to shoot to its sights. Trying to adjust the point of impact on fixed-sighted handguns can be a real chore, often requiring the services of a skilled gunsmith, and sometimes with the possibility of shop expenses running into the hundreds of dollars. Is that necessary . . . do we absolutely have to adjust those fixed sights? Possibly, but that's not cut in stone. Start out by examining the sights very carefully, let's try to determine if they appear to have been damaged or else altered in some way. Does the front sight "stand straight"? If the front sight has obviously been bent or lowered, or if the rear notch has been filed open, then some mechanical repair may be mandatory. On the other hand if the sights appear to be unaltered, then a trip to the shooting range is in order. You should try exactly the process I suggested earlier to test the gun for inaccuracy. That is to scientifically test-fire the weapon with all available types of factory ammunition. Here's a hint that may set you off in the right direction; all fixed-sighted handguns, at least the ones made by the major manufacturers like Colt and S & W, were test fired and targeted at the factory when they were new, so we know that they were more than likely shooting to their sights when they were originally sold. That fact alone should tell you what you need to know, there is or was at one time, a kind of factory made ammunition that would shoot to the sights in this gun.

This is especially true in the case of black powder handguns, differences in point of impact are easily caused by the use of smokeless powder propellents. The modern, so-called factory equivalent loads are sometimes given a bullet weight or style that is not compatible with the original loading, this too can alter the bullet's point of impact. We have been told by more

than one importer of replica revolvers that the 'original guns' they use as patterns for their replicas all shot high and to the left or right. I don't agree. It seems more likely that the replica maker, not knowing any better selected an old, used gun for a pattern that had already had its sights altered to suit the eyes and ammunition of some long-forgotten previous owner. Remember, fussy shooters who demand a revolver that shoots to its sights were just as common back in the 19th century as they are today, in fact we think because of necessity, that it was even more so.

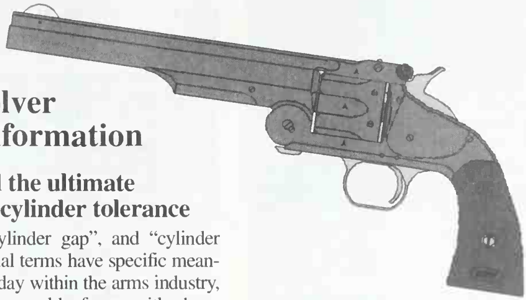
If you have a gun like this, you should try to hand-load or to have hand-loaded, ammunition that comes as close as possible to the original factory black powder specifications, especially the bullet type, bullet weight and muzzle velocity.

As the gun's owner and shooter you may believe you have the last word on the subject of it shooting to the sights. There have been times when I have found it very productive to have another skilled shooter test fire my weapons, especially when there has been a difficulty in obtaining the correct point of impact. Different shooters will almost always hold a gun differently, and this too can change the bullet's point of impact, not to mention group size. Don't be afraid to swallow some pride and allow someone who might be a better shot than you make the final evaluation, it could turn out to be a big help in confirming your own test results. Once you have found a load that shoots well for you and for your gun, by all means stick with it, even if it turns out that the load that works the best is several hundred feet per second slower than a factory loading or what you had hoped for. I say, so what? There are no speed limits on the shooting range, it's the shot that hits the mark that takes the turkey; no matter how long it takes to get there.

1. *The Chemistry of Powder & Explosives* by Tenney E. Davis, 1943, Angriff Press
2. *The Scientific American Cyclopedia of Receipts, Notes & Queries* 1891
3. *The Standard Dictionary of Facts* Frontier Press 1917
4. *The Standard Dictionary of Facts* Frontier Press 1917
5. *Bullet 'N Press*, December 1997
6. *Introduction to Modern Gunsmithing* by Harold MacFarland, Stackpole, 1967
7. *Bullet 'N Press*, December 1997
8. *Introduction to Modern Gunsmithing* by Harold MacFarland, Stackpole, 1967

Chapter 5

Handguns



General Revolver Repair Information

Shaky wheel-guns and the ultimate importance of correct cylinder tolerance

"Headspace", "barrel to cylinder gap", and "cylinder end-shake." Those three unusual terms have specific meanings and they are in use every day within the arms industry, however anywhere outside the world of gunsmith shops and firearms manufacturers their meanings could be very different from the way they are applied to guns. A revolver's cylinder is in effect a rotating breech, so whether or not the cylinder is operating correctly will dictate whether or not the revolver will be able to function properly. By the term correct cylinder operation we mean that the cylinder must be rotating on a fixed axis, within measured tolerance limitations. In time when a revolver is fired, wear will unavoidably occur and as a result those measured tolerances will increase, that is where the gunsmith should come in. Here is what those measured tolerances are:

"Headspace" in a revolver is the term used to define the fixed distance that has to be maintained between the rear face of the cartridge's rim, and the front of the breech face (sometimes the distance is measured from the rear face of the cylinder to the front of the breech face.) This fixed distance is maintained for very good reasons, one of the more important of these is so that most of the cartridge casing will remain contained within and supported by the chamber as the cartridge is being discharged. If the "headspace" distance were too great the cartridge could back out of the chamber under the pressure of firing, causing a bulged or split case and a loss of chamber pressure. Too large headspace distance can also allow the primer to back out of the cartridge case during firing, creating a situation which may prevent the cylinder from rotating.

Of great importance in revolvers with this excess headspace also means that the cartridge's primer is allowed to move farther away from the firing pin; this leads to misfires and unreliable ignition. On the other end of the spectrum, in a cylinder with too little headspace it can cause the rear of the cartridge rims to rub against the breech face and this would give hard trigger pulls and a spasmodic cylinder rotation. In really acute cases of too little headspace, the cylinder may bind up so it can't be turned at all. The explanation of what headspace is and does will be slightly different when it is applied to a single chambered, closed breech weapon without a rim on the cartridge, but in the end the purpose is much the same.

A "barrel to cylinder gap" is the measured distance in between the rear face of the barrel and the front face of the cylinder. The measurement is a fixed distance because of the fact that some clearance between the moving cylinder and the fixed barrel has to be allowed so that the cylinder will rotate without its face dragging on the rear of the barrel. This "air gap" or clearance is normally set by the gun factories to a tolerance of approximately four to eight thousandths of an inch. A barrel to cylinder gap that is too large allows large amounts of the combustion gases to escape, this causes velocity loss, and it allows a disturbing side-discharge to anyone unfortunate enough to be standing near the side of the revolver during firing. When a person continues firing the revolver that has a large of a barrel to cylinder gap it can eventu-

Classic Wheel-Guns

General revolver repair information. Shanky wheel-guns, Revolver Hands and Ratchets, Revolver gas rings. Managing percussion Revolvers.

Colt; 1873, 1877, 1878, Open-top & Percussion, Cimarron Lightning.

Merwin-Hulbert; single action.

Remington; 1858, 1875, Double Derringer.

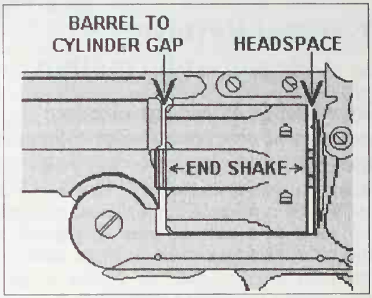
Ruger; OS Blackhawk and Super Blackhawk.

Smith & Wesson; history and description, tip-ups, top-breaks, replicas.

ally lead to what is called "gas cutting"; this a condition where the hot combustion gases act like a small cutting torch and will actually burn metal from the edges of the barrel and cylinder. A revolver with a barrel to cylinder gap that was too small would allow the front of the cylinder to contact the rear of the barrel, this cylinder drag can cause poor cylinder rotation and hard hammer and trigger operation.

"Cylinder end-shake" is the term that gun factories and gunsmiths use to define the amount of front to rear movement or "shake" which is displayed by a revolver's cylinder as it moves back and forth on its axis in between the rear of the barrel and the front of the breech face, or in other words; the cylinder's end-to-end shake. When a revolver is functioning properly, only a small amount of end-shake would be present, with some exceptions allowed for the open-topped, Colt-type percussion revolvers. As the result of normal firing wear and tare all revolvers will in time develop excess amounts of cylinder end-shake. The revolver having an excess of cylinder end-shake allows the conditions we described earlier of too much headspace and then of too small a barrel to cylinder gap when the cylinder is at the forward end of its travel, and/or of too large of a gap between the barrel and cylinder when the cylinder is at the rear of its "end-shake." All of these measurements become variables when a revolver cylinder has end-shake, their measurements will depend on where the cylinder happens to be sitting at the time the measurement is taken.

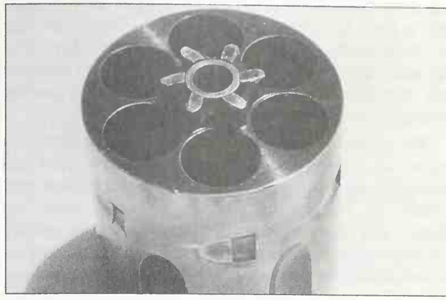
All of these conditions can and do occur on revolvers that have seen much use, they all can and should be repaired at the expenditure of varying degrees of labor.



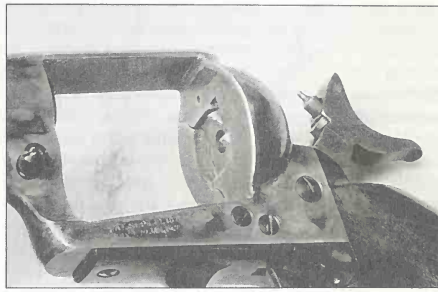
Revolver Hands and Ratchets

What is it? When you undertake the repair of any mechanical contrivance, it means so much that the repair person has developed an understanding of just how the mechanism works. It is that understanding which will account for a good deal of whether or not you will be able to make a successful repair. A lack of understanding, or a misunderstanding of how it works always leads to wasted time, ruined parts and will usually produce an incomplete repair. Here is a basic primer to help the aspiring gunsmith understand exactly how and why the piece called the *hand* operates the ratchet and rotates the *cylinder* in a revolver's mechanism. The exact mechanical nature of any specific repairs involved on individual firearms will be found listed under the firearm's own headings elsewhere in this book.

To start with, let's try to think of the revolver as sort of an iron living thing, a mechanical eco-system if you will, with the active parts being mutually interactive component life forms that all live and work in the same small room. The *hand* is that small and too often unnecessarily a condemned part within a revolver that causes the cylinder to rotate when you pull the trigger or cock the hammer with double action revolvers, or by just cocking the hammer in single actions. Try to imagine the cylinder itself as a rotating "gear" that has teeth on its back end (those teeth would be the extractor ratchet teeth.) In order for the cylinder to rotate, the cylinder's gear teeth are pushed by an arm or pawl that is called the *hand*. Since our cylinder is mounted so that it can rotate (spin) about a central axis; the action of the hand pushing on one of the cylinder's gear teeth forces it to rotate for a fixed distance, in this way the cylinder chamber with the cartridge in it is brought around into battery (where it is locked into alignment with the barrel.) That fixed rotational distance for each chamber in six shot revolvers is 60 degrees (6÷ 360=60)and if we had a five-shot revolver it would have to be rotated 72 degrees for each shot.



This is what the rear end of the Colt Single Action Army cylinder looks like, the "teeth" are the cylinder ratchets which the hand pushes on to rotate the cylinder. Author photo.



A Uberti Cattleman which is a replica of the Colt SAA shown with the cylinder removed. The hammer is cocked and you can see the hand's teeth sticking out the front of the frame. Author photo.

Sometimes the cylinder doesn't seem to want to rotate far enough around, in other words: it isn't being turned quite far enough to be locked into battery when the hammer is cocked (known as cylinder indexing; Smith & Wesson's repair department used to call this "carry up" because the *hand* is actively carrying up the cylinder into index with the barrel) by the cylinder stop; the part that Colt calls a bolt. The cylinder stop or bolt is that little lug that sticks up out of the frame that is meant to lock the cylinder into battery when the hammer is cocked and in most revolvers, when the action is at rest. If the cylinder's chamber was not lined up perfectly with the barrel and the cartridge was fired before the cylinder was indexed, the bullet would, at the least, strike and glance off the side of the barrel's forcing cone, causing the gun to spit lead from the gap between the barrel and cylinder. In more severe cases of misalignment, the bullet may actually hit the rear of the barrel and in the worst case situation, the cylinder could explode.

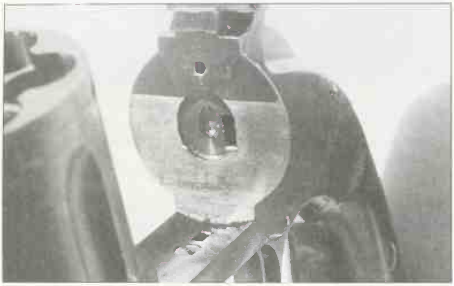
Many people, laymen and gunsmiths alike will immediately blame a cylinder's failing to index on a worn *hand*, assuming what they believe to be the obvious: since that *hand* is what actually rotates the cylinder, then it *must* be worn out. Yes indeed, the *hand* is

Ratchets...

What is it?
The cylinder's axle and lost motion
The single stage hand system
Double Stage hand systems
Smith & Wesson
top-break single actions

what causes the cylinder to rotate and it could be the cause, however the hand is certainly not the only possible cause for this condition, in fact the chances are very good that it isn't. Let's try to not jump to the conclusion that the hand needs outright replacement too quickly, there are *other areas* in the mechanism that we ought to examine carefully, along with the hand, before we toss the poor thing in the trash heap.

The ratchet teeth and hand in this mechanism are known in generic engineering terms as a ratchet and pawl. The ratchet and pawl is a simple mechanical gear system, its basics were used in ancient Greece and Rome, and likely even earlier, but we should quickly learn how important it can be not to jump to firm conclusions concerning simple things. In firearms terminology, the pawl is now generally known as the "hand," and the ratchet as the "extractor teeth" or the "ratchet teeth." Okay, so if the hand is the primary mover, why wouldn't it be the hand that is causing the cylinder not to index? That's easy, in order for this little ratchet and pawl system to function properly the cylinder must first be rotating on an axis that is perfectly on center with the center of the revolver's frame. The cylinder also ought not have any front-to-rear, up-and-down, or side-to-side play (play: movement not originally designed into the mechanism caused by wear or abuse, lost motion) which would tend to allow the extractor teeth move away from the hand, thereby deterring the hand from performing its job.



Here is the breech face of a Smith & Wesson Schofield, to the right and just below the firing pin hole you can see the top of its hand just beginning to poke out of its rectangular slot the frame. The oval shaped depression to the left of the hand slot is the seat that forms the rear of the cylinder's rotational axis when the gun is closed. Author photo.

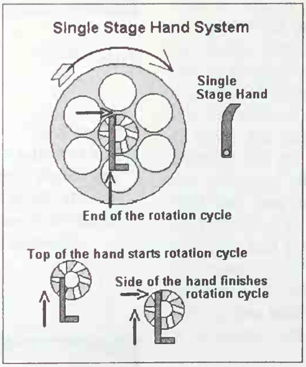
The cylinder's axle and lost motion: These little hands are forced to operate within strictly controlled space limits, and within their confined spaces they can only move for a fixed distance, that movement is in turn governed by the limits of hammer or trigger movement. Therefore, the more the ratchet tooth on the cylinder is allowed to move away from the hand as the result of wear on or around it's axis, the more the hand loses its ability to rotate the cylinder fully. You may understand then, how wear or damage in any of the areas involving the cylinder's rotational axis will introduce unintended lost motion into this precisely fitted ratchet-pawl system, causing it to fail in function as designed. In many of the cases I've encountered, once any problems involving the removal of lost motion on and about the cylinder's axis were corrected, that cylinder began to index perfectly again. Should the cylinder indexing still be faulty after these corrections have been made, now would be the time to examine that hand, its relationship to the extractor teeth, and its fit with the revolvers frame.

Always examine the mechanism carefully, get to know and understand how it works before you jump in with both feet. That simple step can save hours of frustration and often many dollars in wasted parts later on.

The next point that I feel like I have to make is; please learn to avoid the temptation to remove metal with a file and just for now, put all your metal files back into your tool kit. A common mistake, and one of the primary causes of much contagious frustration in gunsmithing work is when people assume that removing metal from something with a file will make the mechanism "work better". Does the reader have any idea as to why that might be? Prudence should always tell you to learn why the parts are there, and to understand how the mechanism was intended to function before any attempt is made to alter an inherent component part. The metal that makes up the part is obviously there for some good reason, and I would bet the gun worked fine when it was new with that metal sitting right where it is now.

There are two basic types of hand-ratchet systems, the single stage, and the double stage with variations on both.

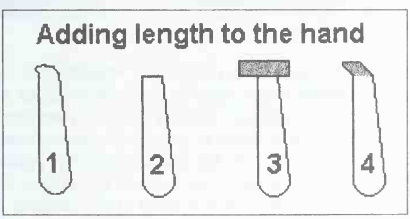
The single stage hand system: The single stage hand system makes use of only one tooth or cog on the hand's top to force the cylinder to rotate from one chamber to the next. More simply put; one cog on the hand pushes on one ratchet tooth from the start to the finish of the rotation cycle. Therefore, in a six-shot revolver that one cog on the hand revolves the cylinder for the full 60 degrees it takes to move that chamber into index with the barrel. Smith & Wesson for one, has always used a single stage hand system.



The single stage hand system used by S&W employs only one tooth or cog to operate one ratchet tooth and rotate the cylinder to the next chamber.

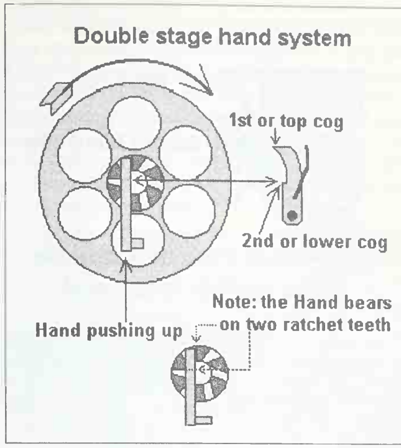
If we will look closely at the relationship the hand has with the cylinder's ratchet teeth, we can see that in the single stage system it is not the very top surface of the hand that completes the cylinder's rotation to lock the cylinder into index (although many people assume this is what occurs.) In reality it is the top-side of the hand that is pushing on the side of the extractor tooth to complete cylinder rotation. A single stage hand's top is active at the beginning of cylinder rotation and it stays active for most of the rotation cycle, however that job of final cylinder indexing is accomplished by the hand's side. Now that you know this, perhaps you can see why a modern double action revolver that has a loose cylinder yoke (Colt calls this a crane), would cause the revolver's indexing to fail? Such looseness in the yoke would permit the extractor's ratchet tooth to move away from the hand's side, and given that situation the cylinder could fail to carry-up even with a brand new hand. Modern side-swing double action revolvers present us with the extremes of possible cylinder axis play, although so-called fixed cylinder revolvers can have the same maladies. For example, in Colt Single Action Army types this same failure to carry-up could be caused by a worn base pin, enlarged base pin holes in the frame or a worn out base pin bushing, in fact it might be a combination of all three; in any case, leaving the cylinder loose enough to move away from the hand.

Examine the fit of the hand with the area of the frame where the hand fits: they call this the hand window. When a hand is a loose fit "side-to-side" here it can cause exactly the same end result as a loose yoke would. A worn hand window will not support the side of the hand so the side of the hand can't push the ratchet tooth far enough for the cylinder to be rotated all the way. Smith & Wesson and other revolver makers traditionally sold service-oversized hands to help the gunsmith correct this wear problem. Any oversize is of course, in the thickness, and not normally in the length of the hand.



1-This hand has a broken tip. 2-The first step in the repair is to file or grind the top of the hand flat. 3-A small piece of hardened steel is silver soldered onto the hand's top. 4-The new hand tip is carefully ground to match the original hand's shape.

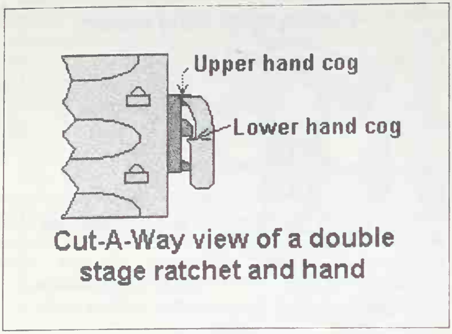
Double Stage hand systems: With double stage hand systems, like the sort used by Colt in almost all of its revolvers since the early 1870s, the hands have *two cogs or teeth*. They work like this; the first or top cog



The double stage hand system like Colt uses makes use of two hand cogs and two ratchet teeth.

engages one ratchet tooth on the extractor to begin the cylinder's rotation, just like the single stage hand system does, and this top hand cog pushes the cylinder from the start of rotation until approximately the half-cock position is reached (the example here is a single action revolver.) After the cylinder has been rotated approximately past the hammer's half-cock position, a second or lower hand cog begins to engage the next lower ratchet tooth in line and this second hand cog and ratchet tooth are what will finish the cylinder's rotation. Again, it is that lower hand cog pushing on the second ratchet tooth that pushes the cylinder into the final index position.

When a double stage system such as the Colt fails to index, we would want to be looking at that lower hand cog and to its fit with the next ratchet tooth in line on the extractor ratchet. How about a small fly in the ointment, just to keep everyone thinking? In the ideal, Colt double stage systems are actually supposed to use BOTH cogs bearing on two ratchet teeth at once to lock that cylinder in battery, and that my friend is a pretty neat trick. In practice, though, it ends up being the top of the lower cog that actually does most of the work during that final indexing period. Now, do you remember what I said earlier? *"Look to the fit of the hand with the ratchet teeth."* with the double action models, check carefully to see if the crane has side-play. With a Colt side-swing cylinder D.A. revolver especially, this condition will cause the cylinder to be offset diagonally, this in addition to its being held out to the side, where the ratchet teeth are placed even farther away from the hand. In many cases, simply aligning that crane back to factory specifications will cure the indexing trouble, and probably quite a few other rotational problems.



Cut-a-way side-view of the double stage hand-ratchet system shown at the end of the rotation cycle (hand is all the way at the top of its stroke.)

Single action revolvers using the double stage system won't have this particular problem since they don't usually have cranes or yokes, and yet they have another set of worn areas which can result in the same symptoms. If a Colt type single action has an indexing glitch, we really would want to correct any problems involving cylinder *end-shake* (front to rear cylinder play) or *cylinder wobble* that may have been brought about by a worn base pin, base pin bushing, or even the holes in the frame that the base pin rides in. Once again, any sort of play like the above will tend to move the *ratchet teeth farther away from the hand*, that in itself can prevent the hand from doing its job. A very loose cylinder fit will also allow the cylinder to rotate on a faulty axis, often causing it to bind during rotation. Obviously, any of these above faults will need to be corrected before we think about going after the hand.

This Colt's hammer is in the first or so-called "safety" notch.

The second hammer position also known as half-cock.

The Colt SAA hammer fully cocked, ready to fire.

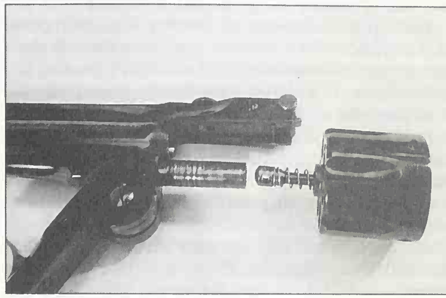
Colt type single action revolvers, whether they have single or double stage indexing, are presenting us with two separate but related indexing areas that we need to address. The first of these is at the half-cock or loading position, the second is the index-at-battery position. This close relationship of the hand to the ratchet teeth will have a direct affect the location of the chamber that is supposed to be lined up with the loading gate opening when the revolver's hammer is placed at half-cock.

Oh. . .back up a minute. We mustn't forget that in this type of revolver the location (or you may read that: condition) of the hammer's notches, and the trigger's sear area will have a direct, and profound effect on where the cylinder will index in both the above mentioned positions. All of this is inter-related, so the entire revolver mechanism always has to be taken into consideration. I

said something earlier about not jumping to conclusions. With this type of revolver, the top of the hand; that first stage or cog in the Single Action Army, this is the one that will affect where the cylinder's chamber will be located when the hammer is placed at the loading position. By chance if someone has taken a file to this upper cog to "repair" some imagined timing problem, the poor chambers will never line up with the loading port when the hammer is put at half-cock. This is a situation that can also produce what some call a spasmodic or jerky cylinder rotation, because sometimes shortening the top cog or leg will cause the second cog to contact the next ratchet tooth too early, causing a momentary bind.

Pay special attention to the condition of the hammer notches and the trigger sear when working with some percussion Colt revolvers, and certain other types of single action revolvers like the Remington and Smith & Wesson that use the single stage hand-index system to rotate the cylinder. With this system the condition/location of the hammer notches and trigger sear are acutely important, and bear even more heavily on proper cylinder indexing than with a double stage system.

Smith & Wesson top-break single actions leave us with still another set of potential problem areas because the barrel and cylinder assembly has been hinged on the frame so any misfit, however slight at the barrel to frame connection will have a dramatic effect on that revolver's cylinder timing. Top-break revolvers also use a cylinder axle (the base pin) which is supported only at its front end, leaving open the potential for it to become bent. Should the base pin become bent in a top-break revolver it will cause the rear of the cylinder (where the ratchet is of course located) to be moved off the center line, and this has just about the same effect as a bent crane or yoke would in a modern side-swing revolver: that is the ratchet is moved too far away from or in some cases, too close to the hand.



Because top-break revolvers like this Navy Arms Russian model use a base pin that is supported at the front end, there is the chance for it to become bent and that can have quite an effect on the revolver's timing.

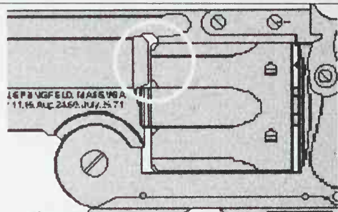
Revolver Gas Rings

What is a gas ring? The gas ring is a part used on many revolvers, although the part is of little or no particular importance to us in these days of clean burning, smokeless powders. This is a part that many folks have never even heard of, and would never know was there unless it was pointed out to them. However, the gas ring was a terribly critical component on some revolvers during the age of the black powder cartridge and it still is if black powder is the propellent to be used.

Black powder fouling will interfere with the rotation of the cylinder if it is allowed entry into the cylinder's axle hole around the base pin. A revolver's gas ring is a hollow tube of machined steel that is pressed into the front face of a revolver cylinder. It goes into the same hole where the cylinder rotates on the base pin and it is intended to form a partial gas seal to aid in keeping powder residue out of the rotating cylinder's axis. There is a lot of awfully dirty fouling that quickly builds up around the front of the revolver's cylinder as the result of the discharge of high pressure black powder gases that will always leak from the barrel to cylinder gap when a cartridge is fired. The gas ring seal first appeared on the Smith & Wesson .44 caliber Model Number Three American of 1870, and it was designed as a means to help deter this fouling by deflecting some those high pressure combustion gases away from that cylinder axle hole, from the beginning this idea proved a very effective one. Colt Single Action Army have an easily removable base pin bushing and this too was machined to form an effective gas ring seal, while in other revolvers like the Smith & Wesson the gas ring seal is a separate, but not readily removable part. The Merwin-Hulbert twist-barrel revolvers have a particularly effective mechanically interlocking gas ring seal built into the front face of their cylinders and the rear face of their barrels.

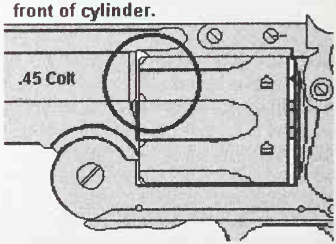
Fouling of the cylinder's axle area never presented much of a problem before there were cartridges. Cylinders in most cap 'n ball revolvers were fairly sloppy, often made with a good deal of front to rear movement (cylinder end shake) so when the gun was fired, there was often a momentary, if partial seal of the gap between the barrel and the cylinder. Colt's open top percussion revolvers offered the least in terms of fouling troubles, by not having any frame top-straps in the way; the combustion gases had a full 360 degrees of open airspace to leak into. But when metallic cartridges came along, their use in revolvers required something called "head space"; this is a distance between the rim of the cartridge and the breech face that has to be maintained at a constant measurement (see glossary.) Maintaining that headspace meant that a constant barrel to cylinder gap should always be present and that gap will leak combustion gases. Significantly, the 1871-72 Open-Top, which was Colt's first real cartridge revolver, had a gas ring in its cylinder. With revolver frames that have "top straps," the strap tends to deflect ever-more of those high pressure gases from combustion downward and directly toward the cylinder axis hole.

Notice from the illustration that an attempt has been made to offset the barrel to cylinder gap from the opening at the front of the gas ring, so the gap is not directly over the front of the gas ring. Here was an intentional part of the initial gas ring design scheme. The illustration shows an S&W Top Break type revolver, but is a typical late 19th century revolver design. This will help to explain why some of the imported replicas of Smith & Wesson top-break revolvers do not function very well with black powder cartridges. The replicas have been equipped with longer cylinders than the original revolvers had, this effectively places the barrel to cylinder gap right over the opening at the front of the cylinder's gas ring. In this case the original design is altered, I fear without much consideration given to the consequences of black powder fouling. With this layout, those combustion gases are driven directly into the cylinder axle, where the fouling will very quickly bind up the cylinder and stop its rotation.



Above:
Original S&W Schofield in .45 S&W Caliber: notice location of barrel / cylinder gap relative to location of gas ring at front of cylinder.

Below:
Imported Schofield replica in .45 Colt caliber: notice barrel / cylinder gap is almost directly over the gas ring at front of cylinder.



Managing Percussion Revolvers

Getting acquainted. If you haven't had much experience with percussion revolvers, which are also called cap 'n ball pistols, you will find the management, loading and handling of these revolvers to be much different from what you have been used to, especially if your only experience has been with modern cartridge firearms. For those who have had no experience with percussion revolvers at all; the biggest difference between these and cartridge revolvers is in the loading. The latter only requires that we read the caliber printed on the cartridge box to be certain we have the right cartridges before we load them into the cylinder. The former is actually a muzzle loading weapon which requires some thought, care, a knowledge of the subject and of course patience; it will take you far more time to load the cylinder of a percussion pistol. To load a percussion revolver, you will have to hand assemble powder, bullet, bullet lubricant and primer as separate components into the cylinder's chamber, which will perform the function of a cartridge casing.

Just because these percussion revolvers are terribly slow to load and might be a hundred and fifty years old, don't ever make the mistake of assuming that they are not lethal weapons. The front loading pistol is just as lethal and sometimes nearly as powerful as some modern magnum cartridge revolvers. This country fought a terribly bloody Civil War with percussion weapons that were very much like the ones we are dealing with here.

What you need to know to handle and shoot a percussion revolver safely. You will need to be sure of your pistol's caliber and you should determine what size balls or bullets to use, how much, and what granulation of black powder to load. What size of percussion cap will properly fit the nipples, and finally. . . how you will put all of these components together. The word "cap" of course, refers to the percussion cap that will be used to ignite the powder charge and when we use the word "ball," we are referring to a common, soft lead *round ball* (standard fodder for these guns) in contrast to *Conical balls* so-called, which are bullets often cast with a hollow base and intended specifically for use in percussion revolvers.

What caliber? If the gun is a modern reproduction figuring out the caliber will be easy, you can simply refer to the maker's instructions or contact the importer. If you have an original percussion revolver or if you are but do not have the maker's instructions, then the gun will have to be identified first. Most of the popular percussion revolvers were made in three basic calibers, .31, .36 and .44. Normally a .31 caliber will use a .315" ball. Most .36 caliber pistols will use a .375" ball (they are really .38s) and, the .44 (which is actually a .45) will use either a .452" or a .457" ball. In order to be certain what size ball will be correct to use in your gun, I would strongly recommend that you measure the inside diameter of the mouths of the chambers in your cylinder. This can be done with a dial caliper or an inside micrometer. The chamber mouths should be just a bit smaller than the size of the ball you will be firing. As an example, if you have a .36 caliber Navy-type Colt, and its chamber mouths measure .376"; I would suggest a .378" or even a .380" diameter round ball. Although most manuals call for a .375" ball size in this gun, variances in chamber diameters like this will occur often from gun to gun, particularly with reproduction revolvers. So why use a ball that is larger than the chamber? The method here is that you should have to squeeze the ball down slightly during loading and that will help it seal against the sides of the chamber. Not only is this an aid to accuracy, but it helps to prevent multiple discharges as well as helping to keep the ball or bullet in place during recoil while the other chambers are being fired.

History by Dave...

Getting acquainted.
What you need to know.
What caliber?
Black powder caution.
Bullet lubricants.
Percussion caps.
How to load one.
How much powder?
If you put in too much powder.
Never leave space.
Where's the ball?

Black powder caution. The name black powder or gunpowder indicates what is called a low grade explosive. Don't let that "low-grade" thing fool you, black powder is definitely an explosive and it can injure, maim, or kill if it is mishandled. So play it very safe when you handle this stuff, don't ever smoke or use lit matches or flame around open black powder.

Bullet lubricants are traditionally added to the front end of the cylinder last and placed on top of the ball after you have seated it over the powder charge in the cylinder. The lubricant is supposed to help prevent leading and black powder fouling. It is also there to help prevent multiple discharge, a.k.a. *chain firing*. To put it in laymen's terms, the lard will prevent a spark from igniting the powder in one of the other chambers instead of, or along with, the one you are intending to fire. This lubricant was originally lard or tallow. Today we have a multiplicity

of choices when deciding which over the ball lubes to use, or pre-lubricated patches (designed to go *under the ball* between powder and bullet). These are all factory made and available to the consumer over the counter. In a pinch you can even use wheel bearing grease, very messy but effective unless it is a hot day! Some folks recommend Crisco as a black powder lube. The best I can say is, I have tried it; don't bother. While it will work to a point, the first shot will melt the Crisco from the surrounding chambers, leaving vegetable oil all over everything.

Percussion caps are small explosive caps that act as the primer in all percussion weapons. With revolvers we will be dealing basically with two sizes of caps, the #ten or #eleven. You might want to purchase a tin of each size to see which will fit your guns' nipples the best. The percussion cap should be a snug fit over the nipple. It should be tight enough so that it will not fall off of its own weight, but never so tight that you have to beat it on. Do not ever, never use striking force to seat a percussion cap! I sincerely hope the reasons for the last statement are obvious to all.

How to load one. Let's walk through the sequence of how to load a cap'n ball revolver. First make absolutely certain that all the cylinder's chambers are empty. The empty chambers will now need to be dried of oil before you charge them with black powder. Sometimes shooters dry the chambers by placing percussion caps on all the nipples, and then firing them through the empty chamber. Now we are ready to begin loading.

Place the hammer at its half-cock or loading position. Hold the revolver with its muzzle pointing up, in a safe direction and away from your face. Use a powder measure to dispense the correct charge of black powder into each chamber. A black powder charge should never completely fill the chamber. What you want is for the powder level to be about half the diameter of a ball from the top of the chamber mouth, it may take a bit of experimenting to determine exactly what the perfect charge level is for your revolver.

The rule of thumb regarding how much powder to use: You want the ball or the bullet to compress the powder charge approximately one eighth of an inch once you have it seated completely. Use this rule for all black powder loading, whether it is cartridge or percussion, and you will find it helps to give you overall good accuracy by providing more uniformity from shot to shot. Visually check each chamber to be sure each one is charged with powder and that there appears to be the same amount of powder in each chamber. If you are using over-the-powder wads, now is the time to place one wad in each chamber; right on top of the powder charge after you have visually inspected the powder level. Here you may place a ball or conical bullet on the lower chamber, this is the one that is in line with the rammer. Operate the rammer in order to push the ball into the chamber, and be sure you seat the ball to the point where it is just below being flush with the cylinder's chamber face. Give some thought to what you are doing here; if you don't seat this ball far enough into the chamber, it could stick out of the cylinder far enough forward to prevent the cylinder from turning. That can also happen very easily if you have put too much gunpowder in the chamber.

If you put too much powder in the chamber and the ball you just tried to load is sticking up above the chamber mouth: There is no choice but to stop right there and remove the cylinder from the gun. First things first, dump all of the gunpowder that is sitting in any other open cylinder chambers into a suitable receptacle and move that receptacle out of the area where you are working. The ball you loaded will have to be pulled using a screw-type worn or ball-puller and then it will be discarded. Now you can dump the powder charge that was under it just like you did with the others. Begin the loading process again, only this time be more careful to use less powder by paying attention to the powder charge level before you place a ball in the chamber.

Never leave space between powder and ball. If you have used a lighter than normal powder charge that does not fill the chamber until it is nearly full, then be certain you seat the ball fully down onto the powder so that the powder charge is compressed by the ball. I'll say it again, never leave *an* air space between the powder and the ball. Do the same thing for each chamber until they are all charged with powder and ball, making attempts to note that each ball is seated to an identical depth in its chamber. Some people prefer to load each chamber with powder and ball individually, one at a time and you may certainly use this method if you prefer it.

Where's the ball? Uh Oh. . .you have just noticed that in one of the chambers the ball is seated much deeper than all the other balls are. This probably means you have forgotten to charge that chamber with powder, so its a dud. The way most folks handle this is to go ahead with the loading procedure for all the other chambers, but do not put a percussion cap on this chamber, leave it uncapped. You may fire the gun normally, shooting all chambers except that unloaded chamber, after the rest of the chambers are empty, the ball can be pulled out with a screw-type worm and discarded, or sometimes you can remove the nipple and the drive the ball out from the rear of the cylinder using a steel rod and hammer.

Assuming everything has gone fine, you have all your chambers charged with powder and all the balls are correctly seated. If were are going to use an over the ball lubricant, now would be the time to apply it. I use an ice cream stick to force the lube into the chamber mouths and then flush it off neatly. Removing the loaded cylinder from the gun to apply the lubricant is sometimes easier than greasing up each individual chamber while its in the revolver. Now the percussion revolver is almost ready to fire, all you need are the percussion caps.

Fitting the percussion caps should always be the last step in your loading procedure with the cap 'n ball revolver. I want you to think about what you are about to do: As you install the percussion caps, you are priming the loaded chambers, so keep the muzzle pointed downrange in a safe direction for this entire operation. Percussion caps are merely slipped over the nipples and pushed home with your thumb or with a capper until they look and feel like they are fully seated. You can buy a number of various kinds of capping devices to help you in this operation and if you have large fingers they will be a big help. The skinny in line cappers are the ones that I suggest for revolver use. As I mentioned earlier, the caps should be a fairly snug fit over the nipples, tight enough so they will not fall off when the gun is in recoil although never so tight that the caps have to be forced on. Never, and I mean never try to force a percussion cap unto the nipple of a loaded cylinder.

If you are not going to shoot the gun right away, the safest thing to do would be to leave the nipples uncapped until you are actually ready to fire the gun. If the nipples are already capped, but you do not want to shoot the gun right away, you may safely rest the hammer in either the groove or the pin found on the rear face of most percussion cylinders, these are located in between the nipples where it is intended that you may safely rest the hammer until you are ready to fire.

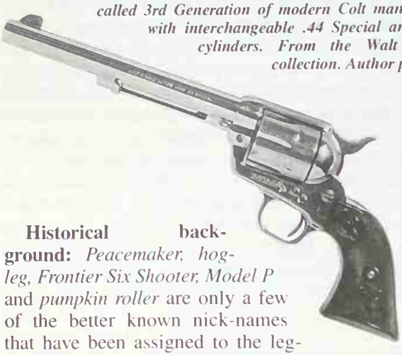
Before shooting any firearm, but especially with percussion arms, I strongly recommend that you wear impact resistant safety glasses, as well as hearing protection. There is always a real danger with the percussion weapon of flying bits of copper from an exploding percussion cap hitting you in the eye. With any black powder firearm, if the gun fails to fire when the trigger is pulled, keep the muzzle pointing downrange and just WAIT for at least three to five minutes to see if it is going to fire. If the cap has fired but not the powder charge, there could be oil in the rear of the chamber that has soaked into the powder. What can happen here is that if the defective cap has caused even a small portion of that powder to ignite, it might be smoldering for some time before it decides to explode. This would be called a hang-fire. Wait that full three to five minutes before attempting to re-cap that chamber with a new percussion cap. After five minutes we can usually call it a fail to fire, a dud cap, or perhaps. . .somehow you forgot to put the powder into that chamber?

Colt Revolvers

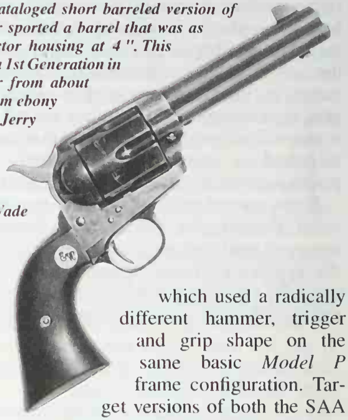
1873, 1877, 1878, Open-top and Percussion, Cimarron Lightning

Colt Single Action Army Model 1873

Including replica revolvers made by Armi San Marco and Aldo Uberti



The 7 :barreled Colt SAA is a real classic, this one is a so-called 3rd Generation of modern Colt manufacture with interchangeable .44 Special and 44-40 cylinders. From the Walt Penner collection. Author photo.



The standard cataloged short barreled version of the Peacemaker sported a barrel that was as long as its ejector housing at 4 ". This original Colt is a 1st Generation in .45 Colt caliber from about 1916. The custom ebony grips are by Jerry Meacham of Charlotte, NC. From the Ed "Buddy" Wade collection. Author photo.

Historical background: *Peacemaker, hog-leg, Frontier Six Shooter, Model P* and *pumpkin roller* are only a few of the better known nick-names that have been assigned to the legendary Single Action Army revolver which Colt introduced in 1873. After testing, the design was quickly adopted by the U.S. Army and used by them extensively during the Indian Wars period. SAA's were used as well by many lawmen, outlaws, cowboys and other famous characters who participated in the winning of the west. The *peacemaker* has been a favorite child of the Hollywood western movie throughout most of the 20th century and largely because of this, the weapon is probably the most well recognized firearm on the planet.

There were, or are actually three production runs or manufacturing time periods for the Single Action Army or *Model P* as the factory called it. The First Generation or original production run which was manufactured from 1873 through 1940 totaled 357,859 revolvers[1] (that total including both Bisley and SAA Target models.) In 1956 the "Second Generation" SAA was introduced and made up until 1978 when certain engineering changes (denoted by the letters "SA" after the serial number) gave us the "Third Generation" SAA which is still being produced. During First Generation production (from 1894-1915) a variant of the SAA was produced called the *Bisley Model* which used a radically different hammer, trigger and grip shape on the same basic *Model P* frame configuration. Target versions of both the SAA (1888-1896) and the Bisley (1894-1913) were made available during the early production and are termed by collectors as the "Flattop"[2].

This is one of William Mason's designs that has proven itself to be rugged in the extreme, one that will still work in a pinch even with several critical parts broken or missing. Some of our more dextrous shooters have shown us that the old Peacemaker is capable of being fired with a much greater speed than might seem plausible for a gun with such a rudimentary action. On the other hand, one down side of the design is and always has been its slow, awkward system of loading and unloading at the rate of one shell at a time. The Colt SAA and its replicas are single action only and are made with removable grip straps. Over the years the SAA has been offered in many calibers such as 32/20, .357 Magnum and 44/40 Winchester, but the standard, and most popular chambering has always been the venerable .45 Colt. Standard revolvers were cataloged as having barrel lengths of 4", 5 "and 7 "although in the early years the factory would supply virtually any custom barrel length the buyer asked for.

It's A Classic...

- **Historical background**
- **Basic Troubleshooting the Single Action Army**
- **Repairs:**
  - **Mainsprings**
  - **Bolt tips**
  - **Bolt and Trigger springs**
  - **Cylinder end-shake and base pin bushings**

For years there have been replicas, or what some term "clones" of the SAA being imported into the US from factories in Germany and Italy. For the most part these copies are less expensive than Colts, and so they have found a waiting market in the many Americans who are both shooters and Colt SAA fanciers. Some of the earlier copies gained poor press by being crudely made, having parts that were prone to breakage and so often requiring the services of a skilled gunsmith before they could be used for any serious work. By and large the modern day copies have improved in quality to the point where (with a few exceptions) most of today's out-of-the-box Single Action Army replicas are serviceable weapons as purchased, with many of the newer products of Aldo Uberti showing exceptionally fine workmanship.

Basic Troubleshooting the Single Action Army: This revolver has long been very popular and there is a ton of good collector information available in books to help us decide before buying if a Colt and its major parts are original and of the proper manufacturing period. However, there has been very little in print to explain how to diagnose mechanical problems which could easily be expensive and might have a profound effect on the value of that same weapon. An otherwise beautiful *appearing* gun might need potentially expensive repairs that would otherwise have gone unnoticed until much later, perhaps turning a revolver that you thought was a *great deal* into a *not-so-great deal*. Alright, then how do you know what to look for first, and how do you avoid becoming confused while looking over the revolver? The answer is to learn to troubleshoot the design.

This SAA from 1916 has the later push-button type base pin lock, sometimes called the smokeless latch.

Shown here on two Uberti copies of the Colt, on the left is the early or black-powder Single Action Army method of fastening the base pin with a stop screw, on the right is the later method using a spring loaded cross-pin. Author photo.

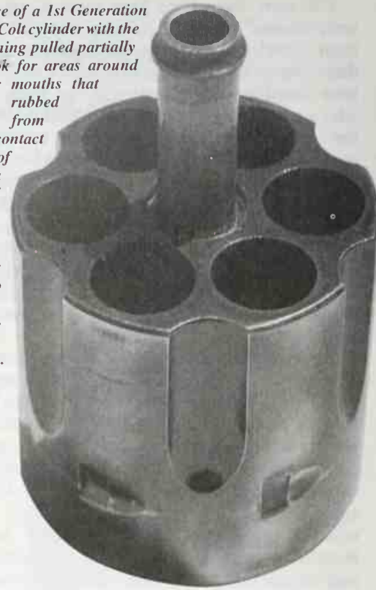
Troubleshooting is not complicated at all, its only a fixed method or procedure that you can follow to successfully accomplish a task, which in this case will be to examine the mechanical condition of this revolver and to determine what, if any problems it may have. Once you learn this procedure, you may repeat its steps every time without confusion. Below you will find an example of the system I have used to check out Colts and other single actions of this basic type. Other gunsmiths may use a different method and that is fine, just as long as it brings you to the same end. In order to troubleshoot any firearm successfully, you must first make yourself familiar with the designs' internal mechanism. Start by carefully studying the exploded parts diagrams of the gun until you understand for yourself how the gun works, and what all its parts look like. If you are not already well versed in the design, get your hands on one, take it apart and reassemble just it as many times as it takes in order for you to grasp exactly how it is that all the parts interact as the revolver is operated.

These troubleshooting procedures will work for the Colt Single Action Army models, as well as most of the "clones" which have mimicked the traditional Colt design.

Begin by pointing the muzzle in a safe direction, then pull the hammer back two clicks to place it in the "half-cock," or more precisely, the loading position. Open the loading gate, and check to be absolutely certain this gun is *not loaded*. As you turn the cylinder, make sure each of the chambers are empty, and while you are at it take a moment to notice where the cylinder's chamber holes stop with each audible click. The chamber holes should be stopping at about the center of the loading gate opening in the frame. If the chamber holes are not lining up with the loading gate opening, then the cartridge rims won't clear the edges of the frame during loading and unloading. An apparent misalignment here can be an early indication that there are internal problems with the hand, the hammer, the trigger or all three. If your gun exhibits this sort of a misalignment, make a note of it, we'll come back to address this later on in our procedure.

Whether the gun is an Uberti Cattleman Colt replica or a genuine Colt SAA like this one, the cylinder's chamber should be just about centered in the loading gate opening when the hammer is placed in the second notch or half-cock position.

Cylinder procedures: Long experience has taught that so many of the problems associated with a revolver's operation can be quickly traced back to the cylinder itself, so let's concentrate on that area before going any farther. We will want to examine both the fit and the relationship of the cylinder with the frame and with the barrel. You can start by checking the cylinder to see if it has any front-to-rear movement, this kind of movement is termed "cylinder end-shake", and there should be almost none. If there seems to be a lot of cylinder end-shake, then you should measure it to see exactly how much lost motion there is. End-shake can be measured by using automotive "feeler gauges" that you will slide in between the "gap" at the junction of the barrel and the cylinder.



The front face of a 1st Generation single action Colt cylinder with the base pin bushing pulled partially forward. Look for areas around the chamber mouths that have been rubbed "bright" from making contact with the rear of the barrel, an indication of excess end-shake. A new base pin bushing is used to correct cylinder end-shake. Author photo.

While you are working with the front of the cylinder, have a look at its front face also, to see if it is being rubbed "bright" by coming into contact with the rear of the barrel. Any cylinder that has been contacting the barrel certainly does have excessive end-shake and most likely excessive headspace, these faults will often lead to (among other things) serious operational reliability problems during the cocking and firing stages.

Measuring barrel/cylinder gap, cylinder end-shake, headspace: So, what is a correct barrel to cylinder gap? For starters that gap is supposed to be a fixed distance between the barrel and the cylinder, not as in the case of a gun with end-shake, a variable distance. A barrel to cylinder gap that is within the range of from four and eight thousandths of an inch is considered as being "normal". A less than normal gap leaves little or no room for powder and lead fouling to accumulate and the cylinder might bind up as a result. More than the normal gap can mean gas and lead spitting from the sides of the gap, a loss of accuracy and velocity. But if the cylinder has back and forth movement (end-shake), how is the measurement taken?

Your measurement will be determined by the largest feeler gauge that will slip between the barrel to cylinder gap. For the sake of example, let's say that you have measured a gap of .014" (that is, fourteen thousandths of an inch) between the barrel and the cylinder by sliding your automotive feeler gauges between the barrel and cylinder; in measuring you have allowed the gauge

thickness to push the cylinder as far as it would go to the rear, and that .014" was the biggest gauge that would fit. Now remove the gauge, then hold the cylinder hard forward so it cannot move to the rear, and measure the barrel to cylinder gap again. We will assume that you able to slip a .001"(one thousandth of an inch) thick feeler gauge between the barrel to cylinder gap this time, with the cylinder held to the front of the revolver. This indicates the revolver's cylinder has a total end-shake movement of thirteen thousandths of an inch (.014" [largest gap] -.001" [smallest gap] =.013" total cylinder end-shake.) With that large of a gap, which is five thousandths over the maximum, you know that this gun will need to have its barrel "set back" (threaded deeper into the frame) in order to correct this excessively large space between the barrel and cylinder after the cylinder end-shake problem has been corrected.

Headspace: In the revolver which fires a rimmed cartridge, headspace is determined to be a distance that exists between the front face of the standing breech and the rear of the cartridge rim. A revolver with too little headspace may allow the cartridge rims to contact the standing breech, and this can interfere with proper cylinder rotation. Too much headspace can lead to misfires; since this condition has allowed the cartridge primer to move away from the firing pin. Revolver headspace may be measured quickly by inserting feeler gauges between the cartridge rim and the breech face, the largest feeler gauge that will fit indicates your "rim clearance" or headspace, and in the ideal this measurement for center-fire, rimmed revolver cartridges is six thousandths of an inch. Headspace chamber gauges are another method of measuring headspace, these look like machined steel cartridges and they fit into the cylinder

To measure the "gap" between the barrel and cylinder, slide automotive feeler gauges between them, using greater thicknesses each time until one refuses to slip in: The last thickness gauge before that was your barrel to cylinder gap. Revolver courtesy of Cimarron Firearms. Author photo.

Using a Brownells cylinder gauge to measure the headspace on an Uberti manufactured single action from Cimarron Firearms. The .060" blade you see in place is the "GO" gauge, the .068" or "NO-GO" would indicate excess headspace. Revolver courtesy of Cimarron Firearms. Author photo.

chamber. Yet another way revolver headspace is measured is by using a special revolver headspace gauge from Brownell's, called a "cylinder gauge". This is a feeler-type gauge that fits between the standing breech face and the rear of the cylinder, the thickness of the gauge taking into account the cartridge rim's thickness. Almost any revolver that has an excess of cylinder end-shake will also display excessive headspace.

Timing problems and end-shake? Oh yes, with a revolver that has a lot of cylinder end-shake, its cylinder is moving forward thereby also moving the ratchet teeth away from the hand along with it, this will have some effect on cylinder timing, and on the hand's ability to carry the cylinder up into index. By now you are getting the idea; an excess of cylinder end-shake can be a real bane to the revolver's operation because it may have so many negative effects on different areas of the weapon.

Right . . . then just what is the correct amount of cylinder end-shake? I would like to say "next to none" because that's the way I like to fit a revolver. In reality, perhaps one to two thousandths of an inch is alright, and as long as the barrel to cylinder gap has been maintained at a maximum of eight thousandths, this gun should function fine without any repairs. Exactly what happens to a revolver with excessive end-shake when it is fired? Each time the weapon is fired its cylinder is slamming rearward in recoil, and in so doing, it is hammering the back of the frame, then when the bullet enters the barrel, the frame and barrel recoil backward; slamming the frame into the front of the cylinder at the base pin. Unless this cylinder end-shake condition is correctly repaired, you may count on this problem getting worse, it will not go away.

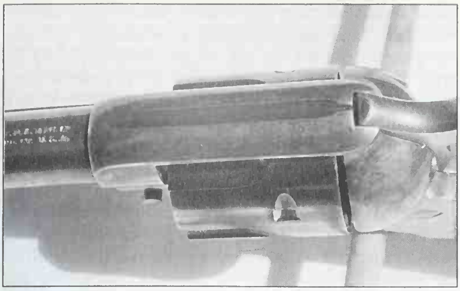
That excessive cylinder end-shake and along with it the excess headspace can be removed by having a gunsmith fit the gun with base pin bushing. As we explained in chapter four, and below, this will move the cylinder back to the rear and hold it there. In terms of money spent on gunsmithing labor and parts, this might mean two hundred dollars or probably even more if the barrel also needed to be "set-back" in order to correct a very large barrel to cylinder gap. Since the cylinder is obviously an important component, really its the *heart* of any revolver, we need to make certain of all its functions so we are going to keep on until all the bases have been touched.

With the hammer still remaining at the half-cock position, try the cylinder for axis wobble by attempting to "twist" it from side to side within the gun frame, there should be very little or (ideally) no axis wobble. If you see noticeable movement, look over at the base pin; at the point where it sticks out of the front of the frame, up there underneath the barrel. Is it moving along with the cylinder as you wobble it? When the base pin stays still, then the cylinder axis wobble problem should be correctable by having a new cylinder bushing installed. On the other hand, if that base pin does wobble along with the cylinder; the base pin and possibly its axle holes in the frame are worn. Pay careful attention to this part of the procedure, the repair for this is a new standard base pin; at a minimum. In the worst case scenario it could mean that a new, oversize base pin will have to be fitted, and in that case the axle holes through the frame and through the new cylinder bushing will have to be reamed to fit the oversize pin.

Do you have a gun that seems to have all the above problems? Then it would be wise to remove the cylinder so you can check the fit of the cylinder bushing in the cylinder itself. Is the bushing so loose that it can be wiggled from side to side within the cylinder? If so, then a new bushing might correct this, but in severe cases the cylinder itself may have to be replaced. While the cylinder is still out of the gun, examine the rear end of the barrel carefully around its outer perimeter. You are looking for any cracks or other damages from severe gas cutting (gas cutting in its worst form is often caused by shooting the gun for a long time while it had an excessive barrel to cylinder gap.) Also examine the front of the cylinders' chamber mouths for any cracks, and to be certain the edges of the chamber mouths are "square" and sharp (some folks have been known to polish this area with a buffing wheel while refinishing a revolver, usually ruining the cylinder for all practical purposes.)

With the cylinder still out of the gun, have a look at the frame's breech face, especially the area where the firing pin sticks through the frame to contact the cartridge primer. Inspect this area for excess pitting and examine the firing pin hole to see if it is worn or has been eroded oversized. Measure the distance the firing pin protrudes into the cylinder opening with the hammer down. This distance should measure between from .046 to .056 thousandths of an inch[3]. More protrusion than the maximum could puncture a primer, less than minimum protrusion can give poor ignition and misfires. Any gun that has all or most of the above problems is a severely worn gun which will require expensive labor operations to restore to proper operation. Now put the cylinder back into the gun, shove the base pin in, and let the hammer down.

Action checks. Hammer down: Here we check the mainspring while the hammer is at rest; all the way down or forward, hold the trigger to the rear and pull back on the hammer just slightly. All you want to do here is to see whether the mainspring is placing sufficient tension on the hammer so that it is held down by spring tension and won't have a tendency to "bounce" off the primer. Some folks like to lighten SAA hammers to the point where there really isn't sufficient spring tension. You may test this with a simple spring-type trigger pull gauge by setting the hook of the gauge in the center of the hammer spur's checkering and then pulling the gauge backwards. I like to see at least three pounds of pressure applied before the hammer starts to move off the frame. Our next step in this troubleshooting procedure will look over the cylinder's lockup, ranging, tim-



When the hammer is all the way down, it should still have some mainspring tension holding it there. The gap you see here between the front of the hammer and the frame is typical of 1st Generation Colts, the hammer actually is down as far as it can go. Author photo

ing, indexing, and the condition of the hammer notches and trigger sear. With the hammer still at rest (all the way down), check the cylinder to see if it has radial play (that means rotational movement) by attempting to rotate it both ways and see how much it moves.

If there seems to be a substantial amount of movement there might be trouble here. The fastest, easiest way to decide if a cylinder has too much radial play, is to have previously examined one or more revolvers just like this that you know are in perfect mechanical condition, and from this you would have a basis of comparison. But how much is too much? You would need a special tool to answer that question, a tool called a "range rod." The range rod is a tight fitting, precision rod that is meant to be slid down the barrel's bore from the muzzle, it enables you to detect if the cylinder chambers are in alignment with the barrel. If the range rod will not enter the cylinder chamber when you place radial pressure in either direction of the cylinder, you have a good indication that the bolt and/or the bolt window in the frame is worn. If the cylinder is badly out of index, so much so that the range rod will not even enter a chamber, the gun is probably unsafe and in need of some professional attention. You may also check "cylinder ranging" without the range rod by first removing the hammer. With the hammer out of the way it is possible to look down the barrel from the muzzle while shining a light through the firing pin hole or holding the gun up to a light. Yes, you really can see and get a good indication of cylinder misalignment in this manner. Never do this with the hammer in place on an assembled gun! Not only is this extremely poor gun safety practice, but the hammer restricts the amount of light available through that tiny firing pin hole.

Hammer to the 1st notch: Next with the hammer back in the gun and the revolver again fully assembled, pull the hammer back to the first click, or to what is sometimes called the safety position. While the hammer is in this position, the cylinder should remain locked in battery by the bolt. Look through the frame opening,

The Single Action Army as it should appear with its hammer set on the first notch or "click". Author photo.

between the frame and the rear of the cylinder from the side to see if the firing pin is still sticking out into the cylinder opening. It should not be, but if it is, you have here a sure indication of either a broken trigger sear or, a broken hammer notch or, possibly both. At this point carefully try the "safety" by lightly pulling the trigger; that's lightly! The trigger should be caught by the safety notch and the hammer should not fall. Once again, only pull lightly on the trigger, don't make the mistake of pulling on the trigger too hard, if you do you could end up breaking the fragile trigger sear yourself.

Hammer to the 2nd notch: Let's pull the hammer back to the second notch or half-cock position (also known as the loading position.) The cylinder should be able to be rotated freely now, only in a clockwise direction (viewed from the rear) with the familiar, audible "click, click" sound as the cylinder rotates and the hand moves over the cylinder's ratchet teeth. On a note from earlier in the procedure; with the loading gate open the cylinder chamber holes should be stopping at about the center of the loading gate opening in the frame. If they are not self-centering on this opening, this could be an indicator that the trigger sear and/or hammer notches are damaged (the relationship of the trigger sear/hammer notches determines the chamber locations during rotation) or a hand that may have been damaged or altered. *Lightly* pull on that trigger once again (just like you did above in the safety notch test) to make certain the trigger sear is caught in the loading notch of the hammer, the hammer should not fall, if it does you may have a broken half-cock notch in the hammer or a broken trigger sear or both.

Hammer fully cocked: Slowly draw the hammer back into the "fully cocked" position, noting cylinder


This 3rd Generation 44/40 Colt Peacemaker is sitting in the half-cock position with the loading gate open. Author photo.

rotation as you do this. Pay attention here; in the perfect situation the cylinder bolt should pop up into the cylinder bolt notch in the cylinder at the *exact* moment that the trigger sear engages the hammer's full cock notch. This should all occur with the hammer at just about its maximum rear-most position. If you noticed that the hammer did in fact reach "full cock" before the cylinder bolt could lock the cylinder then we would have yet another indication of a damaged trigger sear, and/or hammer notches. This condition can also suggest a worn or damaged hand and/or cylinder ratchet teeth. Another note from earlier; if you found previously that this gun has excess cylinder end-shake, you may be sure that condition is adding to, or may even be the direct


The 1873 Colt with its hammer fully cocked, shown with the loading gate open and without the cylinder. Notice the big, solid tapered firing pin. From the Ed "Buddy" Wade collection. Author photo.

cause of this problem (IE: If the cylinder is too far forward, the hand may be unable to rotate that cylinder completely). Lastly, try the trigger pull. It should be crisp and should require from four to six pounds pressure to achieve let-off. A long, "creepy" trigger pull, a very hard trigger pull (over eight pounds), or a trigger let-off that is excessively light, can be still another indication of a damaged or "worked over" hammer notch or trigger sear.

After you have accomplished the above troubleshooting procedure from start to finish, you can be very well assured that you will have uncovered most if not all of the serious problems in your single action. Using this procedure every time you examine a single action Colt or a Colt look-alike, will enable you to diagnose potential problems quickly and efficiently. You may refer to the specific repair sections of this chapter below for more details on individual repair operations that relate to problems uncovered by the above procedures.

Repairs

Mainsprings: Sometimes amateur gunsmiths and even a few of the pros will lighten mainsprings in SAA revolvers to a ridiculous point so that there isn't enough spring tension left to hold the hammer all the way down against the primer. Sure this makes for a slick action, but it also slows the hammer fall (lock-time) and may allow the hammer to actually "bounce" off the primer. In some severe cases where the mainspring has been made altogether too light, I have seen hammers that "bounced" all the way to the safety notch and beyond! Guns like this are prone to misfires as well, owing to the light primer strike produced by that wimpy hammer fall. As long and heavy as the Colt's hammer is, making one misfire is not an easy thing to do, you've really got to work at it. Lightening the mainspring that much is a quick and dirty, artificial method of "slicking up" the action and one that I don't recommend nor do I like. To my thinking, if I am trying to hit a tiny spot on a target and I'm shooting one of these single actions with a long distance hammer fall, I need all the help I can get just to hold my sight picture steady while it drops! So I very much prefer the "lively" hammer fall of an aggressive mainspring, even if it means overcoming a slightly heavier trigger pull and that I have to tug a bit harder on the hammer to cock it.

The European arms factories that make many of the replica Colts don't ever seem to have had a handle on what a good spring tension setting is, and I haven't seen one yet that was quite as dependable as an original Colt spring. I call these "way-too springs" because it seems like they are either way-too soft, way-too stiff or they break way-too quickly. This is not meant to criticize, because I will be the first to say that some European springs are of very fine quality, merely to indicate that I have been disappointed enough times by European-made springs that it just makes more sense for me to not

waste my time with the imported springs. If I am after dependability then I simply replace them with Colt or other American-made aftermarket springs.

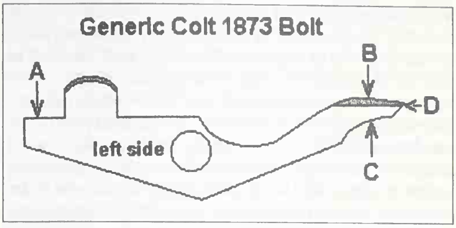
An old 'smithing tradition has been to insert a leather spacer between the frame and mainspring to in effect shove the whole spring toward the rear while causing it to lean forward just slightly. Done correctly this modification can lighten mainspring tension and still leave the spring with enough "whip" to cleanly fire the primers. The only disadvantages of using leather are that it will soak up moisture and eventually rust the steel around it and, of course it will shrink and expand with varying moisture contents. These days we can purchase a far better option in the form of factory-made neoprene spacers from Brownell's that is of the correct shape to accomplish the task of lightening mainspring tension while keeping the spring placed under the hammer in such a manner that a good degree of "slap" remains so the hammer won't bounce back off the primer. We also have the option of purchasing reduced power mainsprings from aftermarket sources such as Wisner's.

Bolt tips: Colt's bolt is one of the more reliable parts of the design, indeed it is the same basic design that Colt brought forward from the late 1840s. Here are some ideas that may prove helpful when you have to fit or re-fit a bolt to any single action Colt revolver.

Keep in mind that it should never be necessary to alter the Colt bolt drastically in any way. Carefully make note of the shapes and contours of the Colt bolt especially at points "B, C and D". Be thoughtful and use caution so that these shapes and contours should remain consistent throughout any alterations you will make to the original bolt.

Two different types of replacement Colt SAA bolts are currently being offered by Ron Smith of Smith Enterprise, they are the best quality the author has ever seen. Author photo.

Notice the shelf at point "A" in the illustration. If the locking lug part of the bolt (that is the part that fits into the cylinder's bolt notch to lock the cylinder, keeping it from turning) were not protruding through the frame far enough, then the desired end would be to bring it up



The 1873 Bolt showing fitting points. A-Removing metal from the top of this shelf allows the bolt to stick up higher through the frame. B- Increasing the bevel on the outside of the left leg eases hammer return. C-moving the circular radius up allows the hammer cam to snap back under the bolt leg, it also causes the hammer to be pulled farther back before the bolt begins to move down.

somehow. If material were removed from the top of the shelf at "A", this would allow the bolt to come up higher so more of the locking lug would stick through the frame into the cylinder opening. Just remember, the bolt is like a see-saw, so when one end goes up, the other end goes down: Thus when point "A" comes up . . . point "C" will go down. As point "C" goes down it must and will come closer to the hammer cam. So after you have caused the front of the bolt to rise, always go back and re-check point "C" to find out how it is mating with the hammer cam.

Should point "C" on the bolt leg come into contact with the hammer cam while the hammer is all the way forward, it may be necessary for you to carefully relieve the leg of the bolt at point "C" until you observe approximately thirty thousandths of an inch clearance between the hammer cam and point "C" on the leg of the capped Bolt. Otherwise point "B-C" may not have enough clearance to snap back over the edge of the hammer cam when the hammer is dropped; if that happens you will have no bolt operation. Any work you do to remove metal at point "C" should be done slowly with a small grinding stone mounted in a hand grinder, always observing that the shape of "C" should remain constantly in the rounded shape of the hammer cam. You will want the hammer cam to contact the bolt first as the hammer is pulled just slightly past the safety position. The hammer cam should let go of the bolt leg at "D" when the hammer has reached the point of being about half way between the half-cock and the full cock notches, or when the cylinder has been rotated about 45 of its full 60 degrees of rotation.

If the leg of the bolt at point "D" is too long then the bolt will be held down for too long a duration of the hammer cycle, if point "D" is too short the bolt may

drop too early. If the bolt is dropping too early, don't blame the bolt immediately, first examine the top shelf of that hammer cam. The top of the hammer cam (the thick area) should be sticking out of the hammer about the thickness of the bolt leg and its edge should be sharp. If only half a bolt leg thickness is protruding from the hammer or if the top edge is rounded; this is probably what is making the bolt fall off too early and the cam should be replaced. The edge at of the bolt at "D" should retain the original angle and shape and it should be square and sharp. Point "B" which is the beveled edge on the bolt leg is where the tapered part of the hammer cam slides over, bending the bolt's leg inward as the hammer falls. You should always maintain the factory angle on this bevel although its top edge may be stoned until it is slightly round, this will sometimes ease resistence during hammer fall.

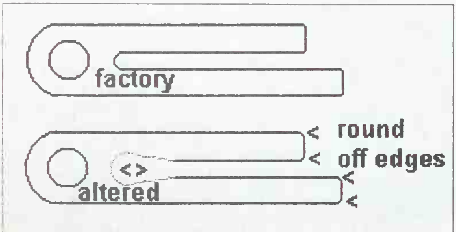
The bolt and trigger spring: This is the little almost flat, "forked" spring found under the trigger guard which Colt calls the sear and bolt spring. It supplies the tension to return both the trigger and the bolt, for the former a moderate tension of from three quarters to one and one half pounds is wanted, for the latter a more "lively" spring action of about five pounds is mandatory. These split-leaf type springs have always been somewhat prone to breakage, and failures of this spring have been a on-going problem with many replica revolvers. Colt's replacement is a quality spring, certainly it is the best one available from any arms manufacturer, and it makes a good "stock" replacement for the replica Peacemakers. While there is little that can be done to alter this critical little forked spring save the careful bending of each leg slightly to modify the tension, there are a few steps you can take to help make it more reliable. One quick and easy step is to stone off all burrs that you see on any of the edges.

When these springs fail, you will most often find that the short "bolt leg" has fractured at about the junction or fork of the two springs. Long ago I was taught a trick that really can help make these springs more dependable by at least slowing down the rate of this breakage, it involves opening up the center-web of the spring, just at its forked junction, into a gentle oval shape as illustrated. This can be accomplished using a small grind stone on a hand grinder to open up and gently polish the edges of the fork to the approximate shape and size in the drawing. Use caution that you don't overheat the spring while grinding, removing only small amounts of metal at a time so you don't destroy the temper of the spring.

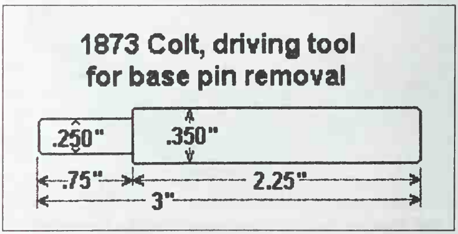
There are also some very good aftermarket springs available, with Leroy Wisner's getting my nod for having the best "out of the box" usable quality of the bunch. A very reliable music-wire replacement spring is also on the market, I've tried them and while they will never break, they only seem to work "okay"; somehow wire springs never seem to offer as much of the "liveliness" that a leaf spring is capable of delivering within the same physical space. We've always found bolt and trigger return to be on the sluggish side with this type of spring as opposed to the leaf spring that the revolver was designed to use.

Cylinder end-shake and base pin bushings: To get rid of the excess cylinder end-shake that we discussed earlier in the troubleshooting portion will involve our physically setting the cylinder backwards so that its ratchet teeth are bearing on the front of the breech face so that it is held there and all forward movement (end-shake) has been eliminated. Removing lost motion in that critical area of cylinder rotation will very often cure some, if not all cylinder indexing or timing problems which existed beforehand.

This job is accomplished by fitting the cylinder with a new base pin bushing so the old bushing must first be removed. Colt SAA base pin bushings are intended to be a slip-fit into the cylinder, so all things being equal; you ought to be able to grab the bushing by the flange that is sticking up above the front face of the cylinder and pluck it out. With some older weapons years of dried up grease and oils, along with accumulations of rust may prevent the "easy" removal of some bushings. For removal of these stubborn ones without damaging the cylinder, a special driver-tool like the one shown can be easily turned out on the lathe. To use the tool, the cylinder is placed face-down onto a cube shaped block of hardwood about three inches squared, that has had a 1/2" hole drilled through it, the base pin bushing is placed over this hole. Our driver-tool is sized so it may



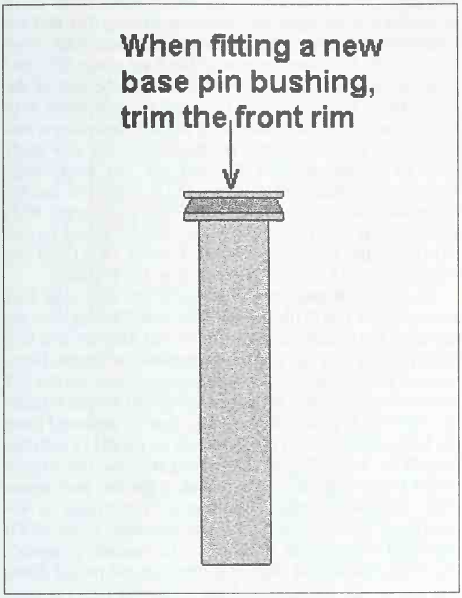
This shows the sort of alteration which may help to ease bolt & trigger spring breakage.



A simple, shop-made bushing driving tool for removing stuck single action base pin bushings.

simply be slipped into the cylinder from the rear and the bushing may be tapped out with a hammer.

This new base pin bushing will have more material on its front end than we will require, so after the bushing has been installed in the cylinder you will not be able to reinstall the cylinder into the frame because the front of the new bushing contacts the front of the frame. Let's look over the frame at both front and rear cylinder contact points before we start removing metal from the new base pin bushing. We also should look at the condition of the cylinder's ratchet teeth to make sure the ratchet teeth are not damaged. I like to run a hard Arkansas stone over the teeth for a few passes, just to remove any burrs and dents that might be present. Stoning the rear faces only won't remove any appreciable metal, but it will certainly help to true up the bearing surfaces so that as much contact as possible is being made with the rear of the frame. If the gun had been fired for years with an excess end-shake condition, the chances are very good that the front of the frame is dented in at the place where the old bushing was slamming into it. When you encounter a gun with a damaged frame like this, make an effort to true this area up with a fine cut mill file, being careful that you remove only a tiny amount of metal, and keeping the area as flat as possible so that as you file, more of the frame contact is being restored for the new base pin bushing to bear against.



The front of this shoulder is where metal would be removed from a new base pin bushing to allow the cylinder to be re-fitted. If necessary, some metal may also be safely removed from the rear shoulder.

Proper fitting procedure when installing the new base pin bushing is to slowly and carefully trim material only from the bushing's front face (preferably, this trimming is done with the bushing chucked in a small lathe) backwards until the cylinder assembly will just slip all the way into the cylinder opening of the frame, with only enough clearance so the cylinder will spin freely when the base pin is installed, and so the cylinder can be removed and replaced without difficulty.

Here are some excellent reference books that you might like to read that will help you understand the Colt Single Action Army's workings;

"The Colt Single Action Revolvers; A Shop Manual, Volumes 1 & 2" by Jerry Kuhnhausen
"Loading the Peacemaker" by Dave Scovill
"Shooting Colt Single Actions" by Mike Venturino
"Shooting Sixguns of the Old West" by Mike Venturino
"The NRA Firearms Assembly Book"

1. *Flayderman's Guide to Antique American Firearms, 7th Edition.* By Norm Flayderman.
2. *Colt's Dates of Manufacture* by R. L. Wilson.
3. *The Colt Single Action Revolvers* by Jerry Kuhnhausen

Colt and Colt Type Single Action Army Revolvers

Takedown instructions

Colt parts nomenclature

1) Always be sure the weapon is unloaded! Check first to make absolutely sure this weapon is unloaded by opening the *loading gate* (#23), next pull the *hammer* (#27) slowly to the rear until you have heard *two audible clicks*; this should have placed the hammer in the *half-cock or loading position* and the *cylinder* (#12) should spin freely in a clock-wise direction. *Keep your fingers away from the trigger* during this entire operation! Slowly *rotate the cylinder two full revolutions by hand*, all the while examining the cylinder's chambers through the opening that has been presented by the opened *loading gate* at the rear of the frame (#20) to make absolutely certain that the cylinder chambers have no cartridges in them.

> **1a) What if cartridges are present?: This is a loaded gun!** Leave the hammer right where it is: In the half-cock or loading position and with the loading gate opened. Using your left hand to hold the revolver securely by the grip, *still keeping your fingers away from that trigger*; tilt the revolver so that the barrel's muzzle (front) is facing away from you and upwards; in a direction that you determine is safe (so that if the gun did accidently fire no one would be injured.) Now, use your right hand to rotate that cylinder slowly, one chamber at a time; ***pausing at each audible click to allow each successive cartridge to fall out of its chamber*** and onto your workbench. If any cartridge will not fall out of its own weight; manually operate the ejector by pushing the *ejector rod head* (#13) located under the front of the barrel) to the rear with your right hand until the ejector rod has forced that cartridge out of the chamber. When you are absolutely certain that there are no more cartridges left in the cylinder chambers, the revolver may now be safely disassembled.

2) Cylinder removal: The hammer should still be resting in the loading or half-cocked position and the loading gate should still be open for this operation. The Single Action Army cylinder rotates on a part called the base pin (#7) which must first be removed through the front of the frame before the cylinder can be taken out. Colt has used two methods of retaining the base pin over the years and both of these have also been used on copies of the Colt. The first method used on Colts up to about serial number 165,000, is the so-called black powder method (not shown): here the base pin is held in by a single lock-screw, located at the front of the frame, below the barrel and ahead of the trigger guard. To remove the base pin you first have to remove this lock-screw, and then the base pin (#7) may be pulled straight out the front of the frame (#12.) The second method is by a sliding, spring powered cross bolt. The base pin is removed by first depressing this cross bolt, which Colt calls the *base pin screw* (#8) and then pulling the base pin (#7) straight out the front of the frame (#12.) The cylinder (#14) may now be carefully slid out sideways from the right side of the frame.

3) Grip and grip strap removal: 3a} If the revolver is equipped with **two-piece grips**; first remove the grip screw from the center of the grip and then remove the two grips, now proceed to step **3b**. In some cases these revolvers will be equipped with ***one-piece grips*** and are disassembled thus: **3b}** Remove the two *back-strap screws* (#2) from the top-rear of the *back-strap* (#1) and remove the single *butt-screw* (# 33) from the butt of the *back-strap*. The *back-strap* (#1) and the one piece *grip* (not shown) may be removed by pulling them down and to the rear as a unit. Once off the frame, the *grip* itself may be pulled straight forward off the *back-strap*. Remove the *mainspring screw* (#33) from the inside-lower area of *trigger guard* (#54). The *mainspring* #32) will now lift out. Remove the two *trigger guard screws* (#34) and the *front trigger guard screw* (#21) and the *trigger guard* (#54) will remove from the bottom.

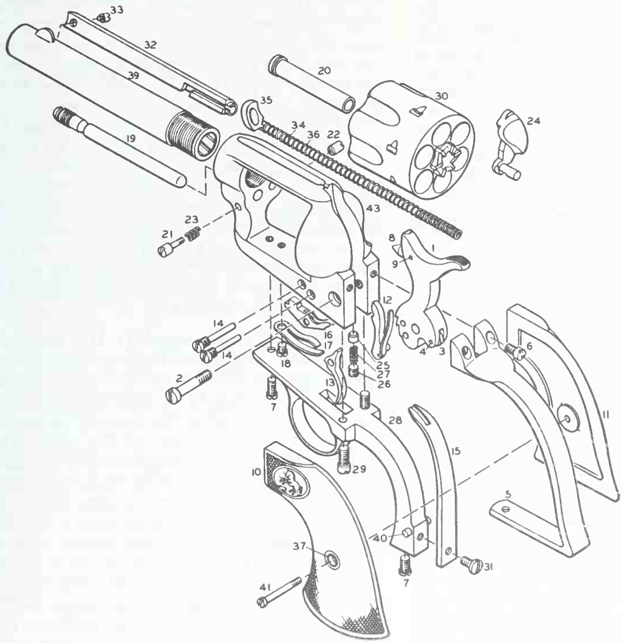
4) Action disassembly: Remove the *sear and bolt spring screw* (#47) [this is the only screw facing straight up] from the underside of the frame and the *sear and bolt spring* (#46) will fall out the bottom of the frame. Next, remove the *forward-most* of the three screws on the left side of the frame, this is the *bolt screw* (#11) which holds the *bolt* #10 in place, the *bolt* may now be removed from the bottom. Be sure to keep the *bolt screw* (#11) with the *bolt* (#10) while they are removed because the *trigger screw* (#55) may easily be mistaken for the *bolt screw* (#11) which is shorter. Now remove the *trigger screw* (#55) and the *trigger* (#53). The *hammer screw* (#30) may now be removed, after which the *hammer assembly* (#27) may be rotated slightly to the rear and pulled down and out of the frame. The *hand assembly* (#31) is connected to the *hammer* and will withdraw with it. Once the *hammer assembly* (#27) is out, the *hand assembly* (#31) may be removed by lifting it up out of its socket hole on the left side of the hammer.

5) Peripheral disassembly: The ejector tube screw (#17) is removed from the front of the ejector tube (#16) and the entire ejector tube assembly may be pulled to the side by its front until it moves slightly away from the barrel, at this position the assembly may be withdrawn forward and off the barrel. The ejector rod (#14), rod head (#13) and its spring (#15) are removed by pulling them both straight back and out of the ejector tube except on early revolvers, with these you must unscrew the ejector rod (#14) from the ejector rod head (#13) and remove each part separately. Loading gate; under the frame in the right side frame rail you will notice a small screw, this is the gate catch screw (#25). Remove the screw (#25) and its plunger (#24 and spring (#26) out through the screw hole. The loading gate itself may now be removed by pulling it out toward the front of the frame.

Reassemble the revolver in the reverse order.

Parts for Colt Single Action Army

1. Backstrap
2. Backstrap screws
3. Balls
4. Barrel
5. Base pin
6. Base pin bushing
7. Base pin screw
8. Base pin screw nut
9. Base pin spring
10. Bolt
11. Bolt screw
12. Cylinder
13. Ejector head
14. Ejector rod
15. Ejector spring
16. Ejector tube
17. Ejector tube screw
18. Firing pin
19. Firing pin rivet
20. Frame
21. Front guard screw
22. Front strap screw
23. Gate
24. Gate catch
25. Gate catch screw
26. Gate spring
27. Hammer
28. Hammer roll
29. Hammer roll pin
30. Hammer screw
31. Hand assembly
32. Main spring
33. Main spring screw
34. Rear guard screws
35. Recoil plate
36. Sear and bolt spring
37. Sear and bolt spring screw
38. Spring
39. Stock, left
40. Stock, right
41. Stock pin
42. Stock screw
43. Trigger
44. Trigger guard
45. Trigger screw
46. Washer
47. Washers, No. 8



Uberti Cattleman Single Action Army Revolvers

Takedown instructions

Uberti Cattleman parts nomenclature

1) Be sure the weapon is unloaded! Always check first to make absolutely sure this weapon is unloaded by opening the *loading gate* (#142), next pull the *hammer* (#2) slowly to the rear until you have heard **two audible clicks**; this should have placed the hammer in the *half-cock or loading position* and the *cylinder* (#5) should spin freely in a clock-wise direction. *Keep your fingers away from the trigger* during this entire operation! Slowly *rotate the cylinder two full revolutions* by hand, all the while examining the cylinder's chambers through the opening that has been presented by the opened *loading gate* at the rear of the frame (#1) to make absolutely certain that the cylinder chambers have no cartridges in them.

1a) What if cartridges are present?: ***This is a loaded gun!*** Leave the hammer right where it is: in the half-cock or loading position and with the loading gate opened. Using your left hand to hold the revolver securely by the grip, still keeping your *fingers away from that trigger*; tilt the revolver so that the barrel's muzzle (front) is facing away from you and upwards; in a direction that you determine is safe (so that if the gun did accidently fire no one would be injured.) Now, use your right hand to rotate that cylinder slowly, one chamber at a time; ***pausing at each audible click to allow each successive cartridge to fall out of its chamber*** and onto your workbench. If any cartridge will not fall out of its own weight; manually operate the ejector by pushing the *ejector rod head* (#164) located under the front of the barrel) to the rear with your right hand until the ejector rod has forced that cartridge out of the chamber. When you are absolutely certain that there are no more cartridges left in the cylinder chambers, the revolver may now be safely disassembled.

2) Cylinder removal: The hammer should still be resting in the loading or half-cocked position and the loading gate should still be open for this operation. The Cattleman cylinder rotates on a part called the base pin (#21) which must first be removed through the front of the frame before the cylinder can be taken out. Uberti has used two methods of retaining the base pin over the years and both of these have also been used on other copies of the Colt. The first method once used on Colts up to about serial number 165,000, is the so-called black powder method (not shown): here the base pin is held in by a single lock-screw, located at the front of the frame, below the barrel and ahead of the trigger guard. To remove the base pin you first have to remove this lock-screw, and then the base pin (#21) may be pulled straight out the front of the frame (#1.) The second method is by a sliding, spring powered cross bolt. The base pin is removed by first depressing this cross bolt, which Uberti calls the *base pin screw* (#140) and then pulling the base pin (#21) straight out the front of the frame (#1.) The cylinder (#5) may now be carefully rolled out sideways from the right side of the frame.

3) Grip and grip strap removal: 3a} If the revolver is equipped with **two-piece grips**; first remove the grip screw from the center of the grip and then remove the two grips, now proceed to step **3b**. In some cases these revolvers will be equipped with ***one-piece grips*** and are disassembled thus: **3b}** Remove the two *back-strap screws* (#32) from the top-rear of the *back-strap* (#1) and remove the single *butt-screw* (# 32) from the butt of the *back-strap*. The *back-strap* (#8) and the one piece *grip* #11 may be removed by pulling them down and to the rear as a unit. Once off the frame, the *grip* #11 itself may be rocked down from the top slightly and then pulled straight forward off the *back-strap*. Note: Some models use a coil spring hand spring and plunger, this is located under the left-hand back-strap screw. Remove the *mainspring screw* #36 from the inside-lower area of *trigger guard* #26. The *mainspring* #20 will now lift out. Remove the two *trigger guard screws* (#32) and the *front trigger guard screw* (#31) and the *trigger guard* (#26) will remove from the bottom.

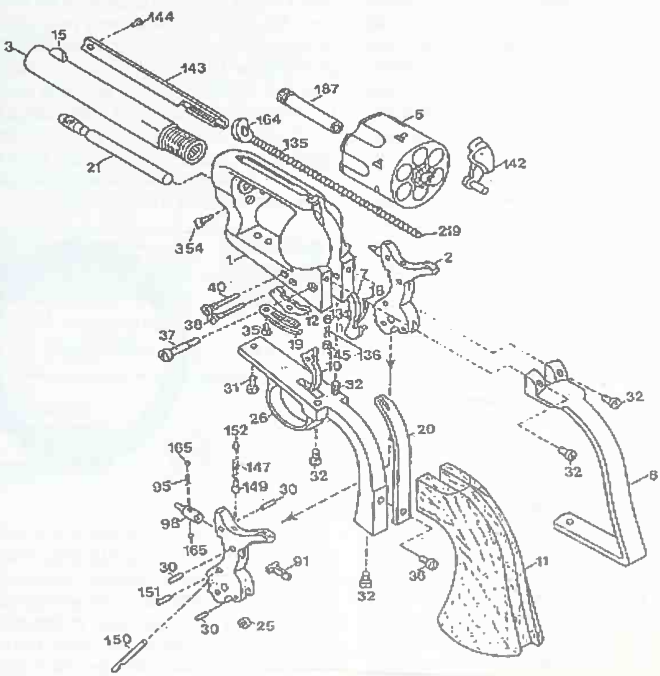
4) Action disassembly: Remove the *bolt spring screw* (#35) [this is the only screw facing straight up] from the underside of the frame and the *trigger/bolt spring* (#19) will fall out the bottom of the frame. Next, remove the *forward-most* of the three screws on the left side of the frame, this is the *bolt screw* (#40) which holds the *bolt* #12 in place, the *bolt* may now be removed from the bottom. Be sure to keep the *bolt screw* (#40) with the *bolt* (#12) while they are removed because the *trigger screw* (#38) may easily be mistaken for the *bolt screw* (#40) which is shorter. Now remove the *trigger screw* (#38) and the *trigger* (#10). The *hammer screw* (#37) may now be removed, after which the *hammer assembly* (#2) may be rotated slightly to the rear and pulled down and out of the frame. The *hand assembly* (#7) is connected to the *hammer* and will withdraw with it. Once the *hammer assembly* (#2) is out, the *hand assembly* (#7) may be removed by lifting it up out of its socket hole on the left side of the hammer.

5) Peripheral disassembly: The *ejector rod tube screw* (#144) is removed from the front of the *ejector tube* (#143) and the entire *ejector rod tube assembly* may be pulled to the side by its front until it moves slightly away from the barrel, at this position the assembly may be withdrawn forward and off the barrel. The ejector (#219), *ejector rod head* (ejector nut #164) and its spring (#135) are removed by pulling them both straight back and out of the ejector rod tube except on early revolvers, with these you must unscrew the ejector rod (#219) from the ejector rod head (#164) and remove each part separately. Loading gate; under the frame in the right side frame rail you will notice a small screw, this is the *gate catch screw* (#145). Remove the *screw* (#145) and its *plunger* or *catch* (#134 and *spring* (#136) out through the screw hole. The *loading gate* #142 itself may now be removed by pulling it out toward the front of the frame.

Reassemble the revolver in the reverse order.

Parts for Uberti Cattleman Single Action Revolvers

1. Frame
2. Hammer assembly
3. Barrel
5. Cylinder
7. Hand assembly
8. Backstrap
10. Trigger
11. Grip(s)
12. Bolt
15. Front sight
18. Hand spring
19. Sear & bolt spring
20. Mainspring
21. Base Pin
25. Hammer roll
26. Triggerguard
30. Hammer pin
31. Triggerguard screw
32. Triggerguard & backstrap screw
35. Bolt spring screw
36. Mainspring screw
37. Hammer screw
38. Trigger screw
40. Bolt screw
91. Hammer safety bar
95. Firing pin spring
98. Firing pin
134. Gate catch
135. Ejector spring
136. Gate spring
137. Base pin spring
139. Base pin nut
140. Base pin screw
142. Gate
143. Ejector rod tube
144. Ejector rod tube screw
145. Gate catch screw
147. Hammer safety spring
149. Hammer safety pin
150. Hammer safety plunger
151. Hammer safety plunger pin
152. Hammer safety stop screw
164. Ejector nut
165. Firing pin sphere
187. Base pin bushing
219. Ejector
455. Connect screw



Colt's Model 1877 Double Action .38 and .41 Caliber Revolvers

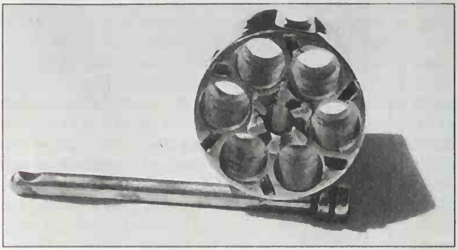
Historical background: Colt's Model of 1877 was that company's first commercial attempt at making a self-cocking or double action revolver. This six-shot, rod-ejector pistol was designed by the well known Colt employee William Mason in 1876 and was intended to be operated as a single or as a double action revolver. Of medium frame size, the 1877 pistols used a small, birds-head shaped grip and they were initially chambered only in the .38 Long Colt caliber, later the .41 Colt caliber was added with small quantities manufactured in .32 Colt caliber. The .38 caliber versions of the 1877 were nicknamed the "Lightning" and .41 calibers have been called the "Thunderer". Barrel lengths ranging from 2" to 7 "were available and the revolvers were made both with, or without an ejector.

Like the famous Colt Single Action Army of 1873 (also a William Mason design), the Model of 1877 used a three position hammer which featured safety, half-cock or loading notch and full cock positions as well as a frame mounted loading gate. Other common Colt SAA features such as the two piece removable grip frame, center mounted cylinder pin and barrel mounted ejector rod made these guns appear, except for their grip shape, quite a bit like a stylized Single Action Army in miniature. Nevertheless appearances are where the apparent similarities to the familiar Model "P" stopped, for the mechanical operation of the 1877 was much more complex, and as history has proven these delicate little double actions were to say the least; far less dependable than their single action relatives.

According to the 7th Edition of *Flayderman's Guide to Antique American Firearms*, a total of 166,849 of the Model 1877s were manufactured from 1877 through 1909. This fairly impressive total number of revolvers manufactured does not change the fact that today a large share of these pistols will turn up with mechanical malfunctions. *So I add this note of caution:* The internal mechanism Colt used in these is overly intricate, many of its critical components are as likely as not to break and these will often do so as frequently as the revolver's action is operated, and that includes non-firing use.

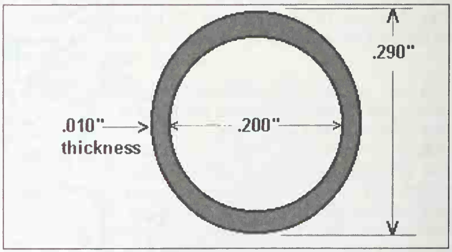
Cimarron Firearms is now marketing a dandy little single action revolver of nearly the exact size and shape as the 1877 which they call the Lightning. This medium sized revolver is being built by Uberti on a smaller frame than the full-size Model "P" and with a birds-head grip and rounded but that is very similar to the early double action Colt product.

Cylinder axis repair notes: For those of you who feel a bit daring and will attempt to repair the 1877's in spite of warnings to the contrary, I will tell you that it is not a design that I think a great deal of, and you may be a bit disappointed at the comparatively small amount of



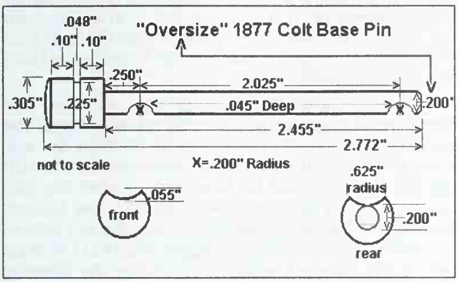
1877 cylinders are locking in the rear, here you can see how crowded it gets in between the chambers. From the John Culligan collection. Author photo

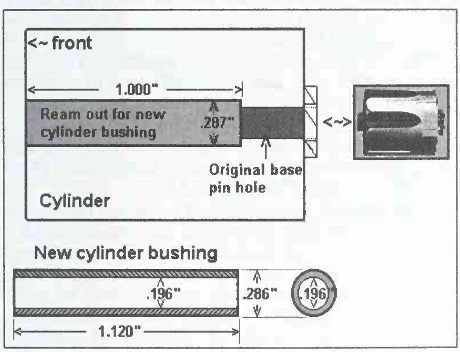
coverage I have chosen to give this firearm. Due to the mechanical shortcomings I touched on above, the lack of good original parts and to their increasing collector values, the 1877 is definitely not a revolver that I would recommend for even casual shooting, nor is it one that I would recommend for any, save a very experienced gunsmith to attempt repair, at least not any gunsmith who I would still want to call me his friend after he has tried. For those who absolutely must, Ed Cox has begun to reproduce some of the more complicated internal parts for the 1877's and because of his vast experience with this model, he would probably be the best person to contact for replacement parts. Dixie Gunworks has some good quality hand and cylinder stop tension springs, and replacement cylinder pins, they also have raw-cast cylinder stops that might be made to work in some guns but after a lot of work.



Just as with the 1873 single action and the 1877's so-called *big brother* the 1878 Double Action Army, if we expect the revolver's cylinder to be able to time and index correctly, then it is imperative that the gun not have any excessive looseness in the cylinder. Many of the guns we see, especially those revolvers that have had a little hard use, will show the symptoms of incor-

rect cylinder indexing and of poor cylinder lockup and these ailments are often traceable back to the relationship between the hand and the cylinder's ratchet. Any lost motion or unintended movement of the cylinder on its axis (the cylinder's axis of course is the cylinder pin or base pin) can allow the cylinder's ratchet teeth to move forward, away from the hand and that condition will quickly cause an 1877's cylinder to be mis-timed and mis-indexed. If your 1877 is apparently working fine in all other areas, taking care of this loose cylinder thing may be just what is needed to restore its proper function. Therefore, removing any excess headspace and cylinder end-shake are the first repair steps to be undertaken along with that of stabilizing the cylinder's rotation on its axis pin. Refer to the repair portions of the Colt Single Action Army chapter for complete details on the methods and procedures involved in removing unwanted cylinder play which because of the similarity in this portion of the two designs, will be equally applicable here.





Does your 1877 cylinder need to be "set-back" in order to correct excess headspace and to bring the ratchet teeth back into their correct relationship with the hand to restore timing? If this were an 1873 or an 1878 we could install a new base pin bushing and use the new material at its front to help us get the cylinder back where it belongs. Trouble is, the 1877 cylinder doesn't have a removable bushing so to accomplish this repair you will have to do one of two things; 1) obtain or make a hardened steel disc shaped shim to fit over the base pin and in front of the cylinder that will cause the cylinder to be held to the rear. Or; 2) you may carefully lathe-ream the cylinder to accept a hand-made, lathe turned base pin bushing, similar to the ones the 1878's use, only on a proportionately smaller scale.

This is the gas-ring at the front of an 1877 cylinder. As this part wears out the cylinder will develop excess end-shake and that can have a big effect on cylinder timing. Repairing the gas-ring requires the skills of a precision gunsmith/machinist. From the John Culligan collection. Author photo.

While you are checking this area, also test the cylinder for any *wobble* (that is; side to side looseness.) Eliminating any looseness or wobble at the cylinder's axis will be a part of the solution to the timing and indexing problems in the 1877, that is why this repair and the headspace repair should to be made before moving on to the rest of the mechanism; and why we always deal with these cylinder rotational issues at the beginning. Repairing this wobbling cylinder situation is a matter of reaming the base pin holes in the frame, (along with the hole through the base pin bushing) to a just slightly larger than standard "oversize", this reaming operation also makes the worn holes in the frame round once again. Hand chucking reamers, in preference to power tools are used for this reaming job and reamers like this are available in decimal sizes and in increments of one, one-thousandth of an inch. Begin by selecting a reamer that is just one, one thousandth of an inch (.001") larger than the original cylinder pin, to use it ream both cylinder pin holes through the frame. Now measure the holes to see if the reaming operation has made them round yet, if not, try another reamer that is just .001" larger than the first, and so on until the holes are perfectly round. Usually this involves reaming .001" to .003" larger than the standard cylinder pin hole diameter. Your cylinder pin bushing (if you have made one, and/or the base pin hole through your cylinder) will also have to be reamed to this new over-size. After this, you will be fitting a new cylinder pin to the frame which you may purchase aftermarket, or depending on the oversize required, custom made in the lathe that is sized to "slip fit" within these oversized holes.

Colt Model 1877 Double Action Revolvers

Takedown instructions

Illustration from The Gun Digest Book of Exploded Firearms Drawings, 2nd edition, edited by Harold A. Murtz ©DBI Books Inc., 1977 Printed with permission of the publisher: Krause Publications, 700 E. State Street, Iola, WI 54990-0001 Phone 800 258-0929

Special notes that apply: This unusual self-cocking revolver design has gained a reputation for being intricate in the extreme and certain of its more complicated parts are well known to be highly prone to breakage. Replacement parts are often scarce, or unobtainable and they can be difficult and expensive to make. The disassembly of these revolvers is recommended only for skilled professional or talented amateur gunsmiths. The use of these revolvers for any purpose other than collecting is not recommended by the author.

1) Be sure the weapon is unloaded! Always check first to make absolutely sure this weapon is unloaded by opening the *loading gate* (#13), next pull the *hammer* (#29) slowly to the rear until you have heard *two audible clicks*; this should have placed the hammer in the *half-cock or loading position* and the *cylinder* (#8) should spin freely in a clock-wise direction. *Keep your fingers away from the trigger* during this entire operation! Slowly *rotate the cylinder two full revolutions* by hand, all the while examining the cylinder's chambers through the opening that has been presented by the opened *loading gate* at the rear of the frame (#9) to make absolutely certain that the cylinder chambers have no cartridges in them.

> **1a) What if cartridges are present?:** ***This is a loaded gun!*** Leave the hammer right where it is: in the half-cock or loading position and with the loading gate opened. Using your left hand to hold the revolver securely by the grip, still *keeping your fingers away from that trigger*; tilt the revolver so that the barrel's muzzle (front) is facing away from you and upwards; in a direction that you determine is safe (so that if the gun did accidently fire no one would be injured.) Now, use your right hand to rotate that cylinder slowly, one chamber at a time; pausing at each audible click to allow each successive cartridge to fall out of its chamber and onto your workbench. If any cartridge will not fall out of its own weight; manually operate the ejector by pushing the *ejector rod head* (#5) located under the front of the barrel) to the rear with your right hand until the ejector rod has forced that cartridge out of the chamber. When you are absolutely certain that there are no more cartridges left in the cylinder chambers, the revolver may now be safely disassembled.

2) Cylinder removal: The hammer should still be resting in the loading or half-cocked position and the loading gate should still be open for this operation. The double action Model 1877 cylinder rotates on a part called the base pin (a.k.a. cylinder pin #7) which must first be removed through the front of the frame before the cylinder can be taken out. The base pin is removed by first depressing the cylinder pin lock screw (#10), this actuates a cross bolt which passes through the frame to unlock the cylinder pin, and then pulling the cylinder pin (#7) straight out the front of the frame (#9.) The cylinder (#8) may now be carefully rolled sideways out the right side of the frame.

3) Grip and grip strap removal: Remove the grip screw (#52) from the center of the left grip and then remove the two grips (#49.) Remove the two back-strap screws (#42) from the rear of the back-strap (#41) and remove the butt screw #43 from the bottom of the back-strap, the back-strap (#41) may now be lifted off the frame to the rear. Loosen the mainspring tension screw (#47) at the front, inside-lower area of trigger guard (#44). Remove the mainspring screw (#40) from the lower inside of the trigger guard and unhook the mainspring (#39) from the hammer stirrup (#33). The mainspring #39) will now lift out. Remove the two trigger guard screws (#45) and the front trigger guard screw (#46) and the trigger guard (#44) will remove from the bottom.

4) Action disassembly: From this point on, pay very careful attention to the exact relationship of the parts you are about to disassemble. Remove the sear screw (#28) from the left side of the frame and this will free the sear (#27) and the hand and cylinder stop tension spring #35) to be removed from the frame bottom. Remove the hammer screw (#32) from the left side of the frame and disengage the trigger strut (#25) from its seat in the hammer while withdrawing the hammer (#29) from the bottom of the frame. Loosen the trigger spring screw (#37) and then remove the trigger screw (#19) from the left side of the frame. You may now withdraw both the trigger (#18 and the hand #17) together out through the bottom of the frame. The cylinder stop (#38) may now be pulled from its seat and taken out from the bottom of the frame.

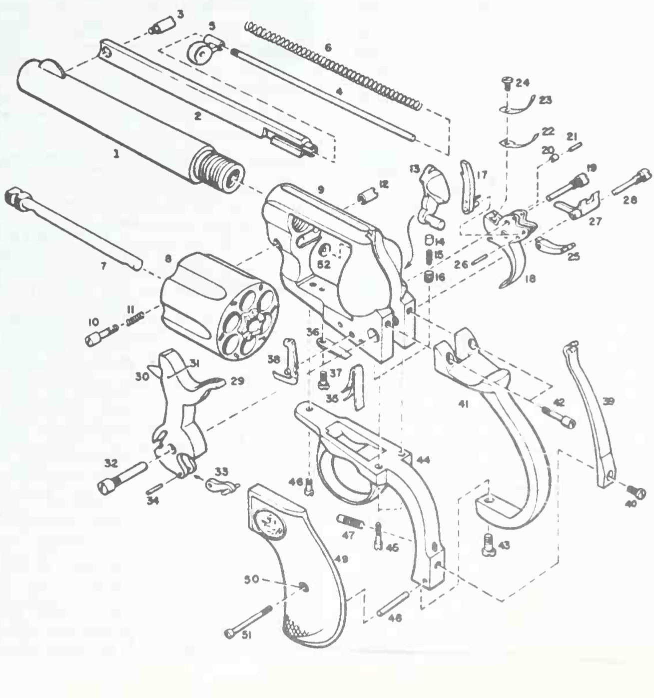
The trigger strut spring (#22) and hand spring (#23) may be removed from the trigger by unscrewing and removing the hand and trigger strut spring screw (#24) from the front-top of the trigger (#18).

5) Peripheral disassembly: The ejector tube screw (#3) is removed from the front of the ejector tube (#2) and the entire ejector tube assembly may be pulled to the side by its front until it moves slightly away from the barrel, at this position the assembly may be withdrawn forward and off the barrel. The ejector rod (#4), rod head (#5) and its spring (#6) are removed by pulling them both straight back and out of the ejector tube. Loading gate; under the frame in the right side frame rail you will notice a small screw, this is the gate catch screw (#16). Remove the screw (#16) and its plunger (#14) and spring (#15) out through the screw hole. The loading gate itself (#13) may now be removed by pulling it out toward the front of the frame.

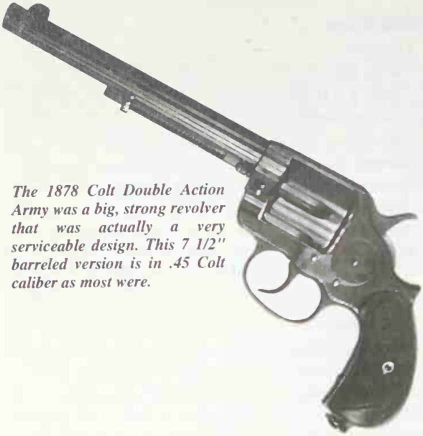
Reassemble the revolver in the reverse order.

1877 parts

1. Barrel
2. Ejector housing
3. Ejector housing screw
4. Ejector rod
5. Ejector rod head
6. Ejector spring
7. Cylinder pin (base pin)
8. Cylinder
9. Mainframe
10. Cylinder pin lock screw
11. Cylinder pin lock screw spring
12. Cylinder pin lock nut
13. Loading gate
14. Loading gate catch
15. Loading gate catch spring
16. Loading gate catch screw
17. Hand
18. Trigger
19. Trigger screw
20. Trigger roll
21. Trigger roll pin
22. Trigger strut spring
23. Hand spring
24. Hand and strut spring screw
25. Trigger strut
26. Trigger strut pin
27. Sear
28. Sear screw
29. Hammer
30. Firing pin
31. Firing pin rivet
32. Hammer screw
33. Stirrup
34. Stirrup pin
35. Hand & cylinder stop tension spring
36. Trigger spring
37. Trigger spring screw
38. Cylinder stop
39. Mainspring
40. Mainspring screw
41. Back-strap
42. Back-strap screws
43. Butt screw
44. Trigger guard
45. Trigger guard screws, rear
46. Trigger guard screw, front
47. Mainspring tension screw
48. Grip pin
49. Grip
50. Grip escutcheons
51. Grip screw
52. Recoil plate



Colt Model 1878 Double Action Army



The 1878 Colt Double Action Army was a big, strong revolver that was actually a very serviceable design. This 7 1/2" barreled version is in .45 Colt caliber as most were.

Historical notes: Colt's 1878 Double Action Army revolver is identical in size to the more familiar Single Action Army, even sharing the same barrels and ejector parts with its more well known cousin. At one point the factory actually altered Model 1878 double action cylinders and used them in production models of the Single Action Army in an effort to use up spare parts. This Victorian age design has been obsolete for a long time now, since 1905 to be exact so this is not a gun that pops up for repair in many shops these days, and very few smiths have had the occasion to work on one. In fact, not many gunsmiths will attempt disassembly, or even try to figure out the design well enough to build an understanding of it. One reason for this is that popular opinion seems to be that the 1878s are a nightmare to repair, are frail and easily damaged and that parts are next to impossible to locate. While those statements are certainly true of its smaller relative, Colt's 1877 .38 *Lightning* and .41 *Thunderer* models; they do not automatically apply to the big Double Action Army which some folks apparently still confuse with the 1877 models. This large framed 1878 double action is very much the better of the two designs, and is an entirely different beast that once understood, is possible to mechanically rejuvenate with much less effort than you may have been lead to think.

Long known for their stiff triggers with very long trigger pull lengths, some 51,210 of this robust double action model were manufactured between 1878 and 1905, the majority being chambered in standard .45 Colt caliber. Other popular caliber chamberings offered in this model were 32-20, 38-40, .41 Colt, 44-40 and .476 Eley as well as a few others. These were made both without ejectors in 3", 3" or 4" barrels and with ejectors in 4 ",5 "and 7 "barrel lengths. A medium-large birdshead grip was used on a rounded butt shaped capped off with checkered hard rubber grips for the majority of production, although some of the early revolvers used checkered walnut stocks. An odd variant of the 1878 is the so-called Model 1902 *Alaskan* or *Philippine Model* which was sold in a U.S. Army contract of about 4,600 revolvers in .45 Colt with 6" barrel. These unbalanced looking pistols came equipped with an extra-long trigger and an oversized trigger guard, in an apparent effort, albeit a crude one, to at last do something about their reputation for *white-knuckle* double action trigger pulls.

Copy of Colts introductory advertising circular devoted to the Model 1878 double action Army and Frontier revolver. This revolver was first made only in .45 caliber, but later chambered for other cartridges. It never enjoyed popularity like that of the Single Action "Frontier."

Something New...

Historical notes
How does it work?
What to look for
The Double Action Army Base Pin
Cylinder end-shake
A look at the timing
The sear and how it effets the loading position
The hammer

How does it work? *Wait just a minute*, you say. . . *after looking over this revolver I see that it has no bolt or cylinder stop anywhere, and the cylinder has no bolt notches, so how is its cylinder supposed to be locked into battery, or did it ever?* Oh yes, that cylinder is meant to lock into battery. Only this William Mason-design is very different from what we would think of as a "normal" revolver, and your understanding of this is the key to its repair; this revolver uses the *hand to not only rotate the cylinder* by pushing on the ratchet teeth when the trigger is pulled, but when that rotation is

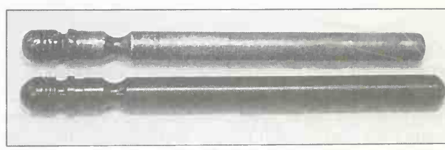
complete at the end of the trigger's pull the hand is also designed so that *its side and part of its lower portion binds on the next ratchet tooth in line* while its top is still trying to rotate the cylinder. Thus, when the trigger is pulled all the way to the rear; the design of this hand and ratchet effectively blocks any further cylinder rotation in either direction. Then with absolutely no separate bolt, the 1878's cylinder might be inclined to rotate backwards when the trigger was released and the hand was lowered, but Colt added a small friction device to the mechanism, either on the loading gate (early models) or just below the hand in the frame (on later models) which prevents this reverse cylinder rotation from occurring during trigger return.

Some of the 1878's we will see, especially on those many revolvers that have seen rough use, will show signs of incorrect cylinder indexing and of poor cylinder lockup. In the 1878 design, hard use and wear will manifest itself as a problem in the above areas. You've probably already guessed it, that relationship between the hand to the cylinder ratchet is *the* important one. So important is that relationship, that any lost motion (unintended movement, usually caused by wear or abuse) in the cylinder on its axis (its axis is the base pin) will quickly cause the 1878's cylinder to be radically mis-timed and mis-indexed.

What to look for: Before you handle or perform an examination on any firearm, first make absolutely certain that it is unloaded, good safety practice dictates this. We will start out here with some basics and go through a quick trouble shooting procedure. When you have an 1878 that exhibits the above mentioned symptoms, the first area to trouble shoot and to repair the if need be, is exactly the same area you would address on a Single Action Army or one of its clones: the base pin, base pin bushing and cylinder. In other words, check the relationship of these parts to one another and to the frame. How well do they fit and function together?

Begin the mechanical examination by pulling back the hammer and placing it at half-cock; the *loading position* (two clicks to the rear; this is also the point where the cylinder will rotate freely.) Look over the cylinder and check it carefully for *end-shake* (*end-shake* is unwanted movement from front to rear) then make a mental note of your findings; we will jump back into this *end-shake* thing with more detail in just a little while. Next, look to see if the cylinder has side to side "wobble", especially at it's rear end, where any excess side-to-side movement will have a drastic effect on the relationship of the hand and the cylinder ratchet: That is the one relationship which is *most critical* to the correct operation of this revolver. Because the hand has been asked to do so much work in this particular revolver design; it is in the nature of the beast to wear the base pin hole in the frame and so develop wobble (looseness) at the rear of the cylinder. If you look carefully, you will probably find that the base pin is a loose fit in the frame because its hole in the rear of the frame has become worn to a slight oval shape. Eliminating this looseness or wobble at the rear of the cylinder will be the solution to many of the timing and indexing problems in the 1878, that is why this repair just has to be made before moving on to the rest of the mechanism; and why we always address this issue at the start.

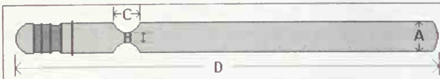
The repair process for this wobbling cylinder situation is to ream the base pin holes in the frame, (along with the hole through the base pin bushing) to a just slightly larger "oversize" and so that they are made round once again. Hand chucking reamers, in preference to power tools are used for this operation. These kinds of reamers are available in decimal sizes and come in increments of one thousandth of an inch. Start the operation by selecting a reamer that is just one, one thousandth of an inch (.001") larger than the original base pin and use it to ream both base pin holes in the frame. Measure that rear hole to see if the reaming operation has made it "round" yet, if not, select another reamer that is just .001" larger than the first, and so on until the hole becomes perfectly round. In most cases this will involve reaming only .001" to .0025" larger than the standard base pin hole diameter. Your base pin bushing will now have to be reamed to this same over-size. After this, you will be fitting a new base pin to the frame which you can purchase aftermarket or custom make in the lathe that is sized to "slip fit" within these newly oversized holes. While you are in the process of fitting the new base pin bushing, you will also be attacking that cylinder end-shake issue we noted earlier. Replacement base pins in oversize inside diameters are available from Belt Mountain and from Smith Enterprise.



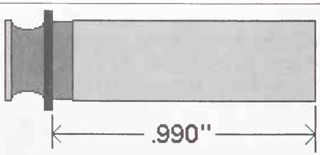
Top: the 1878 Double Action Army base pin, note size of the notch for the base pin lock is deeper and wider than the notch in the 1873 Single Action Army base pin below, also the DA base pin is shorter. Author photo.

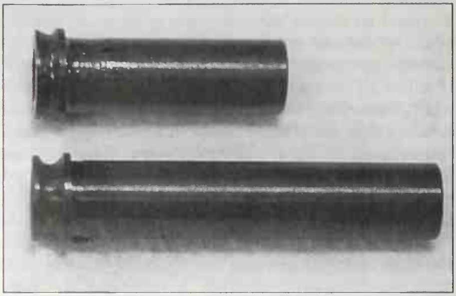
The Double Action Army Base Pin: Base pins from the Colt Single Action Army models may be easily altered to work in the Double Action Army. The 1878 used a base pin that on first glance is identical to the Single Action Army, almost. A close examination of both pins will reveal that the cut for the double action base pin retainer is deeper and wider than the SAA pin, this is because the 1878 DA uses a base pin retainer with a larger diameter than the SAA. While this revolver was being developed, Colt must have realized that base pins

backed out of the frame during the recoil of fast double action shooting, so they altered the base pin retainer to provide this much more effective means of holding the pin in place. Interestingly, this very simple and useful improvement was never applied to the more popular Peacemaker. One other area of difference that should not be overlooked is the overall length of the base pin. In my experience for most double action applications the single action base pins are just a bit too long, and may protrude through the rear of the frame into the action opening far enough to prevent the hammer from falling completely. The gunsmith should pay careful attention to this area when fitting that replacement base pin, and be prepared to shorten it from the rear end accordingly.



We spoke about the base pin hole in the rear of the frame becoming worn to an oval shape, and the related problems that can cause. One reason this is such an acute problem in the 1878 is that the base pin is allowed to rotate with the cylinder, when you couple that base pin's rotation with the large amount of stress induced by the hand during the cylinder's rotation cycle, you begin to understand that the degree of friction and torque applied to that frame hole must be severe. It sounds like we would want to stop the base pin from rotating doesn't it? Why Colt never did we'll never know, but we certainly can. By cutting the notch for the base pin retainer on one side of the base pin only as shown in the drawing, instead of all the way 'round its circumference', we can provide an effective means of preventing that pin from turning in the frame, and it will save future wear in the bargain. High quality genuine Colt manufactured Single Action Army base pins are still readily available, and there are now several aftermarket pins of exceptional quality on the market. A few of these aftermarket base pins we mentioned above, like Ron Smith's and the Belt Mountain products are available in over-sizes as well.





The new, standard Single Action Army base pin bushing shown below (courtesy Smith Enterprises) may be successfully shortened to 1878 double action specifications. Shown here, this 1878 (top) custom-made base pin bushing was shortened from an Uberti Cattleman SA part. Author photo.

Cylinder end-shake:

Let's back up a bit now, back to the cylinder end-shake problem that we briefly touched, and then paused on earlier. The term *cylinder end-shake* defines cylinder front-to-rear movement within the frame, generally this play is unwanted and undesirable. Some end-shake is acceptable, in fact a tiny amount, perhaps a maximum of .001" (one, one-thousandth of an inch) is actually necessary to allow for free cylinder rotation. However, an excess amount of end-shake, that is anything much more than .001", can lead to excess headspace. This is another *key area* in an 1878, and too large or *too small* a gap (space) between the barrel and cylinder. An excess of cylinder end-shake and headspace also means that the cylinder ratchet is moving forward more than it was intended to, at the same time allowing the ratchet to move further away from its critical relationship with the hand: As we've already discussed, the failure of that relationship is one of the major causes of timing and indexing troubles with this design. Excess end-shake by itself can be repaired most readily by replacing the base pin bushing with a new part, fitting it so that its front shoulder bears on the inside front of the frame, thereby pushing and holding the cylinder back against the rear of the frame. This bushing is nearly identical to the Single Action Army bushing (still available from Colt and made by after market manufacturers), except that the rear portion which fits inside the cylinder is shorter; the front portion is the same. A correct bushing may be fashioned quickly by shortening a standard Single Action Army bushing to the dimensions shown in the illustration.

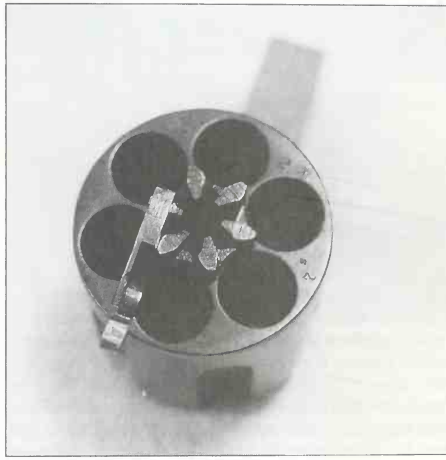
The basic notion which defines the correct way to repair cylinder end-shake is this: The cylinder play should be removed in such a way that the cylinder is forced to the *rear* and held there. When done correctly, the cylinder with its new bushing will have very little (and I mean very little; between five-ten thousandths of an inch; *minimum* and one, one-thousandth of an inch;

maximum), front to rear movement but still be able to rotate freely, and the headspace (in this case, the measurement is taken between the rear of a chambered cartridge case and the front of the breech face at top-dead-center) should now be at minimum specifications, or nearly so (headspace should be set at .005"- .007".) By mechanically impelling that cylinder to stay at the rear of the frame opening, we have forced the ratchet back along with it, so that the back face of those teeth are now bearing on the frame face of the standing breech, under the recoil shield: That, and nowhere else, is exactly where it is intended to be. In this condition the hand is able to properly engage the ratchet teeth. Once again, we have to remember this is the *critical point* in the 1878, because when the hand properly engages the ratchets, it not only serves to revolve the cylinder fully, but at the end of its throw the hand is supposed to bind on the next ratchet, causing tight lockup and preventing *throw-by* (*throw-by* is what happens when the hand causes the cylinder to rotate past the six o'clock position; where it should be in exact alignment with the barrel.) Now let's re-assemble that big Colt double action to see how much the timing and indexing may have improved after making our repairs, which will normally have removed many if not all of the aforementioned woes.

If the improvements you made during these repairs to the cylinder's axis were drastic, you might just find that the gun now has an excessively large barrel to cylinder gap, this would be much more obvious now, after having made the repairs, than it would have before you corrected that end-shake since the cylinder is now being held back at the rear of the frame. You may repair a large barrel to cylinder gap just exactly as you would with any Single Action Army Colt or Colt clone; by setting the barrel back one turn and adjusting the gap while refitting its breech face. Since this chapter is devoted to the "quirks" of the 1878 double actions, there is no reason to elaborate on a procedure which you will find detailed in the chapter on that revolver.

A look at the timing: We will assume that, after repairing the end shake and other cylinder axis deficiencies, this revolver of yours still has some indexing problems, as some few of the more heavily worn guns will. The following portions of this troubleshooting procedure should help cure any remaining troubles, but they shouldn't even be attempted until you have first corrected all the cylinder axis areas we've dealt with previously, to attempt to do so before you have set that cylinder in its proper order will be nothing less than an exercise in wasted time.

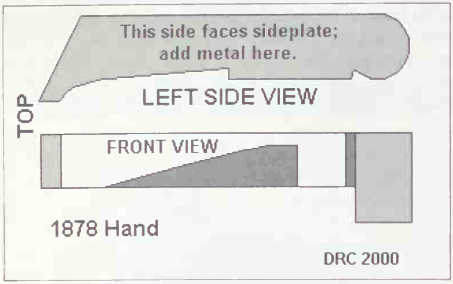
Begin this next phase by first holding the trigger all the way to the rear, then run a range-rod down the bore. If the rod will not enter the cylinder's chamber when the trigger is being held all the way back, you certainly have an indexing problem or, in other words: The cylinder's chamber is not lined up with the barrel. That's a patently unsafe condition and because of it, we have to delve further. For this next test I like to remove the mainspring and the hammer from the gun, but I leave the remainder of the mechanism intact. Pull the trigger all the way to the rear and have a look down the bore. By shining a bright bore-light into the firing pin hole from, you will be able to see clearly if the cylinder has been *"thrown by"* (been pushed too far past index a.k.a. *over-timing*), or if it has not been carried around far enough (not pushed far enough to index or *under-timing*.) When the trigger is pulled and held tightly to the rear, the cylinder *should* be locked in battery with absolutely no radial movement, the existence of that condition offers a quick indication of one of two possible cylinder index conditions: either the revolver is timed perfectly, or it is *over-timing*. On the other hand, if the cylinder exhibits radial movement even with the trigger held all the way to the rear, this is usually an indication that a gun is *under-timing*. Determine which one of these out of index conditions your revolver has, then take the steps below to correct the problem.



If you could see through the gun's frame with x-ray vision, this is just about how the hand would look when the hammer is pulled all the way back, the lower leg on the hand face is engaging the ratchet tooth on the left while the entire right side of the hand is in contact with the side of the lower ratchet tooth, effectively preventing the cylinder from rotating in either direction. Author photo.

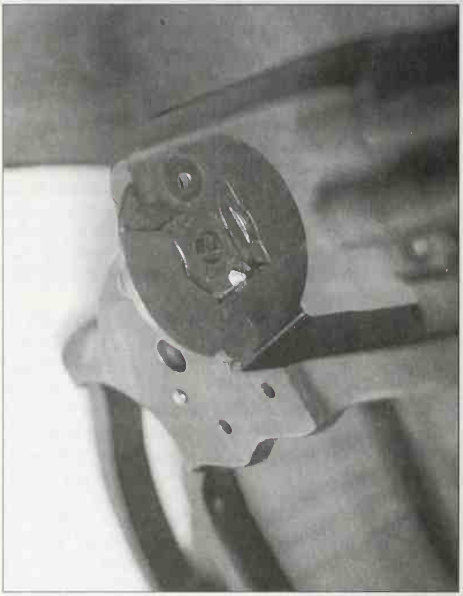
As a rule, the 1878 that is out of index after the cylinder axis has been repaired will be found to have throw-by; that condition where the cylinder chamber is pushed too far and has passed the point of being perfectly in line with the bore. Careful study of the relationship of the hand with the ratchet teeth will reveal that the tops of two of the hand's teeth push on active ratchet teeth to rotate the cylinder toward battery, while the ratchet tooth *under* the active tooth comes up to "bind" against the *center* of the hand on an angled mill cut. The problem itself is fairly simple; the throw-by is being caused

by a worn "hand window" in the frame. The reason we can be justifiably certain that it is the frame window that is worn rather than the hand, is simply that the hands were hardened and the frames were not. If new factory oversize parts were available, one could easily install a slightly thicker hand. At this writing Ed Cox (see the *Sources* Chapter) has recently made available new replacement hands and it is my understanding that he also offers them in varied widths for the gunsmith. In the past however, such parts were not easily obtainable, so gunsmiths have had to invent other means to solve the problem.



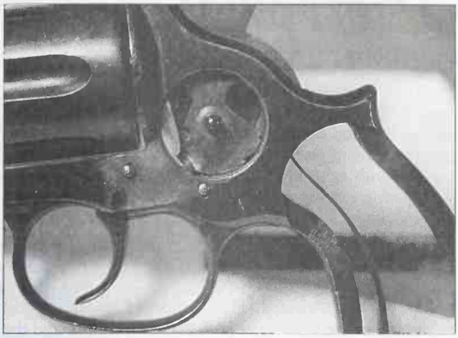
Our "cure" when a new hand is not available will be to make the present hand thicker by welding some new metal onto the left side only. Before we do this, we must make certain that the window in the frame is of a consistent width. As a rule when measured, the windows will be found worn wider at their tops, than at their bottoms. Find the widest point of that window with a good vernier caliper. Now, with thin, fine cut mill files carefully remove metal from the narrower areas of the window's left side only (viewed from the rear), until you have achieved a *constant window width* from top to bottom. Finish off this file work with thin, hard Arkansas oil stones so that no burrs remain. Now you should have a hand window that is of constant width, but its going to be too wide for a good fit with the present hand.

At this point, you are going to fit a new over-width hand or, add just a little metal to the left side of the existing hand by welding (again, left when viewed from the rear) along most of its length to increase its width, as shown in the illustration. Once you have this area built up neatly with weld, dress the welded area down flat with a file until it is .0005" larger than the hand window in the frame. Finish dressing down that welded side with your hard Arkansas stone until the hand is just .0005" (that is just 5/10,000 of an inch) less than the frame window width. Reinstall the widened hand, or a new *wider* hand, with the trigger mechanism and check the cylinder; to see how well it is indexing after your repair job. This repair is in most cases, a *cure-all* and conditions of both over and under-timing normally can often be removed by virtue this operation alone. Should the weapon still exhibit under timing after all this work, the chances are very good that the ratchet itself may be worn past the point of redemption, and a new or replacement cylinder would be in order. Next, let's have a look at the action itself. Rather than dwell on specific repair procedures, let's build a good working knowledge of how the hammer and sear notches work and how profoundly they can effect the rest of the revolver operation.



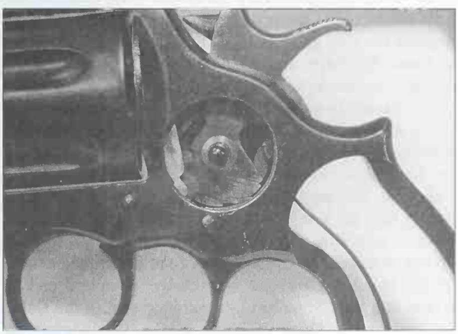
The friction devise that Colt used on later production 1878's to prevent reverse cylinder rotation is seen at center photo, just below the base pin hole in the frame. Author photo.

The sear and how it effects the loading position: Unlike the Single Action Army whose sear is made integral with the trigger so that it acts directly on the hammer notches, the 1878 Double Action Army uses a separate single action sear which operates for the most part, independently of the trigger. Mounted under the hammer, the sear pivots on a cross-pin that passes through the frame. The SA sear's position is directly effected by the hammer's position (and vis-a-versa) and it is pushed up to engage the various levels of hammer notches by tension from its own spring. The only time the SA sear is actively controlled by the trigger is at the point of firing when the trigger has been pulled all the way to the rear, at that point only the rear shoulder of the trigger pushes on the bottom-front of the SA sear, causing the SA sear's tail end to pivot down and away from the hammer notches.



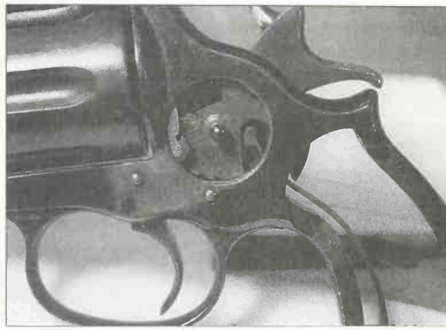
Hammer position one, the first "click" or safety notch. Author photo.

The hammer: Hammers in the 1878s have *three notches* but *four positions* (three active positions and one inactive): 1) the *safety notch* (first click, safe) 2) the *loading notch* (second click, loading) and 3) the *cock notch* (third click, hammer cocked), the fourth hammer position is when the hammer is all the way down (forward) and inactive when none of its notches are engaged with the sear. Here is exactly how the process is supposed to work:



Hammer position two, the loading position. Author photo.

In hammer position 1, the *safety position*; the hammer should be at rest with the SA sear in its first notch, so that the hammer's top-front is approximately .060" from the frame-top, holding the firing pin away from the primer a safe distance. At hammer position 2, the *loading position*; the hammer with the SA sear in the second notch would be at rest about one-half of the way back, and the cylinder chamber exposed for loading and visible at the loading port with the loading gate open should be about centered in that port. Position 3, the *cocked position*; the hammer should be drawn at rest all the way to the rear with the SA sear caught in the cock (third) notch, and the chamber that is under the firing pin should be centered on the firing pin hole. Here it is the SA sear that is the key, that is because the SA sear's condition will directly effect the three *active* hammer operating positions, as well as the positioning of the cylinder at the loading gate. Broken hammer notches will effect one or more active hammer position; but a broken or damaged sear will effect them all. Replacement sears are available today from Ed Cox and from the Numrich Gun Parts Corp..



Hammer position three, fully cocked. Author photo.

That takes us through most of the commonly worn and abused areas of the 1878, and any repairs you have made will certainly offer big improvements for most worn out revolvers, getting them back in shooting condition once more. Barrel work (changing, setting back, etc.) and ejector rod repairs on the Colt 1878 are identical to those same operations if they performed on the Single Action Army, and the barrel's thread is identical to that of the first and second generation SAA models, please refer to that heading for specific details. Whatever you do, don't sell those big 1878 Colt Double Action Army revolvers short, this was one of the better double actions of its time, with a design that is certainly sound enough to be successfully repaired for shooting. With reasonable care and some competent gunsmithing, they should be with us for yet another 12 decades.

Colt 1878 Double Action Army Revolvers

Takedown instructions

Ed Cox parts nomenclature

1) Be sure this weapon is unloaded! *Keep your fingers away from the trigger* during this entire operation. Always check first to make absolutely certain the weapon is unloaded by facing the muzzle in a safe direction and then opening the *loading gate* (#13), now slowly and carefully pull the *hammer* (#23) to the rear until you have heard ***two audible clicks***; this should have placed the hammer in the *half-cock* or *loading position* and the *cylinder* (#8) should be able to spin freely in a clock-wise direction. Slowly *rotate the cylinder two full revolutions* by hand, all the while examining the cylinder's chambers through the opening that has been presented by the opened *loading gate* at the rear of the frame (#9) in order to make absolutely certain for yourself that the cylinder chambers have no cartridges in them.

When the 1878 hammer is placed in the loading position, this is how things should look. Notice the chamber is about in the center of the loading gate opening. Author photo.

1a) What if cartridges are present? ***Then this is a loaded gun!*** Leave the hammer right where it is: in the half-cocked or loading position and with the loading gate also left open. Using your left hand to hold the revolver securely by the grip, and still keeping your *fingers away from that trigger*; tilt the revolver so that the barrel's muzzle (front) is facing away from you and upwards; in a direction that you determine is safe (safe enough so that even if the gun did accidently fire no one would be injured.) Now, use your right hand to rotate that cylinder slowly clockwise, one chamber at a time; ***pausing at each audible click to allow each successive cartridge to fall out of its chamber*** and onto your workbench. If any cartridge will not fall out of its own weight; manually operate the ejector by pushing the *ejector rod head* (#4) located under the front of the barrel) to the rear with your right hand until the ejector rod has forced that cartridge out of the chamber. Only when you are absolutely certain that there are no more cartridges left in the cylinder chambers may the revolver be safely manipulated for disassembly.

2) Cylinder removal: The hammer (#26) should still be resting in the loading or half-cocked position and the loading gate (#13) should still be open in order for you to perform this operation. Colt's Double Action Army cylinder rotates on a part called the base pin (#6) which, just like its single action cousin, must first be removed through the front of the frame before the cylinder can be taken out. The base pin is held in place in the frame by a sliding, spring powered cross bolt which is located at the front of the frame and below the barrel. The base pin is removed by first depressing this cross bolt, which Colt calls the *base pin screw* (#10) and then pulling the base pin (#6) straight out through the front of the frame (#9.) The cylinder (#8) may now be carefully slid out sideways toward the right side of the frame.

3) Grip and sideplate removal: First remove the grip screw (#25) from the center of the grip and then remove the two grips (#42.) The sideplate (#30) which is round in shape and located on the left side of the revolver frame, is held in place by a single screw (#29) which passes from the right side of the frame, that same screw also serves as a pivot for the hammer. The sideplate screw (#29) has a LEFT HAND thread so it must be rotated in a *clockwise* direction in order to be removed. During its removal; hold the screwdriver tightly into the screw so the head stays within its recess in the frame, this will cause the sideplate (#30) to push up out of its seat on the left side of the frame. Make note of the small lug on one side of the sideplate and of where that lug fits within its machined seat in the frame for reassembly. Once you have gotten the sideplate off the frame, *do not remove that sideplate screw* just yet.

4) Mainspring & Hammer removal: Holding the hammer forward, compress the top of the mainspring (#33) with a spreader pliers just enough so that its top-fingers may be disengaged from the hammer stirrup (#31) by pivoting the stirrup forward. Loosen the strain screw (#34) and remove the mainspring (#33) out through the side of the grip frame opening. Pull the trigger so the hammer (#26) cycles all the way back to the point where it disengages from the DA sear; now push the hammer forward while continuing to hold the trigger (#16) all the way to the rear. With the trigger held back and the hammer (#26) in the forward position:

Push out that sideplate screw (#29) and rotate the hammer (#26) to the rear lightly while at the same time pulling it up and out of the frame. Release the trigger.

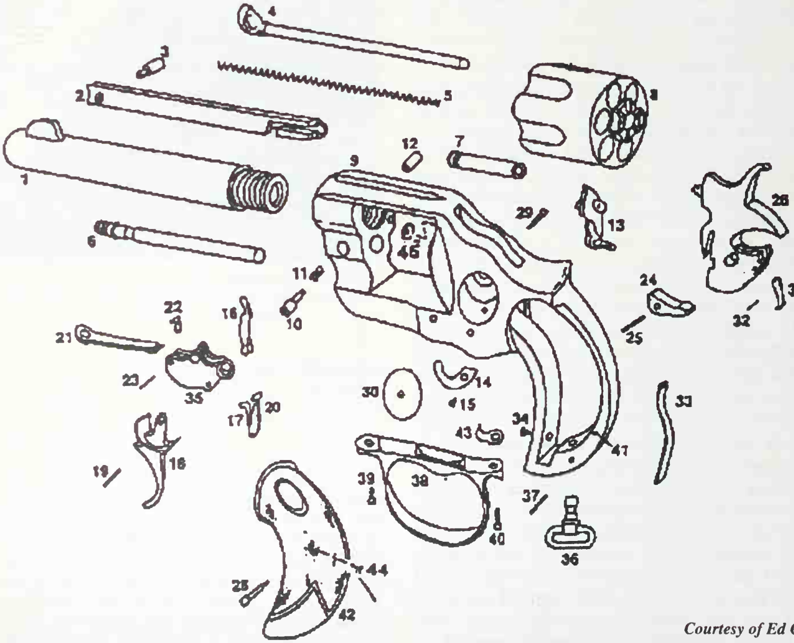
5) Trigger guard and action disassembly: Remove the two trigger guard screws (#s 39 & 40) from the front and rear of the trigger guard (#38) and pull the trigger guard straight down off the frame. Notice: the positioning of the SA sear spring (#43) which will fall out from the rear of the guard since it is held in place by being sandwiched between the guard and the frame. The SA sear pin (#25, the rear-most of the two cross pins passing through the frame) is driven out and the SA sear is removed through the frame bottom at the trigger guard opening. The trigger pin (#19, this is the forward-most of the two pins passing through the frame) is driven out and the trigger spring (#18) can be pulled straight out the bottom, the trigger spring (#21) may be unhooked from its stirrup (#22) connecting it to the rocker (#35) and removed. The rocker assembly is now pushed slightly up and to the rear until it reaches a point where the hand (#16) may be lifted up out of its seat in the rocker (#35) through the round sideplate opening. Once the hand is removed, the rocker assembly may be removed out through the bottom of the trigger guard opening.

6) Peripheral disassembly: The ejector tube screw (#3) is removed from the front of the ejector tube (#2) and the entire ejector tube assembly may be pulled to the side by its front until it moves slightly away from the barrel, at this position the assembly may be withdrawn forward and off the barrel. The ejector rod (#4), rod head and its spring (#5) are removed as an assembly by pulling them both straight back and out of the ejector tube. Loading gate removal; looking through the sideplate opening to the inside of the frame you will notice a small screw just below the hole where the sideplate screw goes, this is the gate spring screw (#15). Remove this screw (#15) and the gate spring (#14) can be removed by lifting it up out of its recess in the frame. The loading gate itself (#13) may be now removed by pulling it out toward the front of the frame.

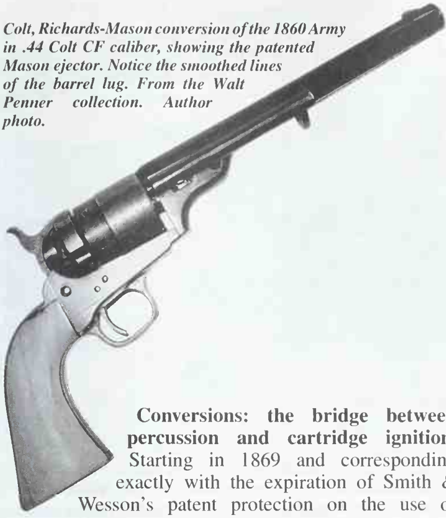
Reverse the order of disassembly exactly to reassemble the revolver.

1878 Colt Double Action Army Parts

1. Barrel
2. Ejector Tube
3. Ejector Tube Screw
4. Ejector Rod
4. Ejector Head
5. Ejector Spring
6. Cylinder Pin
7. Cylinder Bushing
8. Cylinder
9. Frame
10. Cylinder Pin Catch Screw
11. Cylinder Pin Catch Screw Spring
12. Cylinder Pin Catch Nut
13. Loading Gate
14. Loading Gate Spring
15. Loading Gate Spring Screw
16. Hand
17. Hand Spring
18. Trigger
19. Trigger Pin
20. Strut
21. Trigger Spring
22. Trigger Stirrup
23. Trigger Stirrup Pin
24. Sear
25. Sear Pin
26. Hammer
28. Grip Screw
29. Hammer Screw
30. Sideplate
31. Hammer Stirrup
32. Hammer Stirrup Pin
33. Mainspring
34. Mainspring Screw
35. Trigger Saddle
36. Lanyard Ring
37. Lanyard Ring Pin
38. Trigger Guard
39. Front Trigger Guard Screw
40. Rear Trigger Guard Screw
41. Grip Pin
42. Grip
43. Sear Spring
44. Escutcheons
45. Recoil Plate

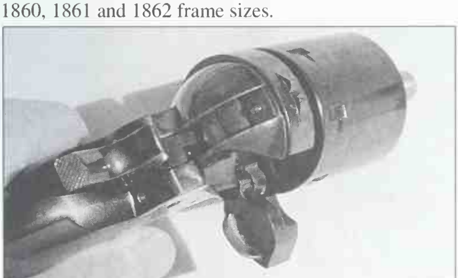


Courtesy of Ed Cox.



Colt, Richards-Mason conversion of the 1860 Army in .44 Colt CF caliber, showing the patented Mason ejector. Notice the smoothed lines of the barrel lug. From the Walt Penner collection. Author photo.

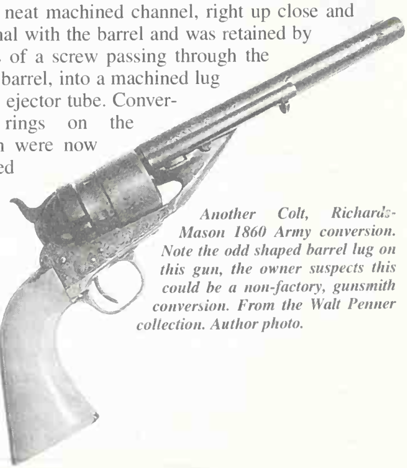
Conversions: the bridge between percussion and cartridge ignition. Starting in 1869 and corresponding exactly with the expiration of Smith & Wesson's patent protection on the use of bored-through cylinder chambers in revolvers (the Rollin White patent), Colt began to offer revolvers for sale to the public which fired metallic cartridges. These guns were based on the common percussion revolvers then in plentiful supply, but converted by Colt to accept metallic cartridges. The first of these conversion revolvers offered from 1869 through 1872, used the system designed by Alexander Thuer, featuring a highly modified cylinder that fired a special tapered Thuer cartridge and which was made to fit into the standard percussion lock frame, enabling the use of either cartridge or percussion cylinders. This system had no ejector rod and the guns actually retained the original cap-n-ball rammer assemblies. A total of about 5000 of these were made in .31, .36 and .44 calibers on the 1849, 1851, 1860, 1861 and 1862 frame sizes.



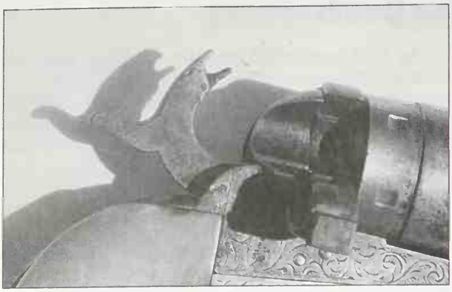
The Colt, Richards conversions used a floating firing pin mounted within the conversion ring, to work with this firing pin the percussion hammers had their faces ground off flat. This is a Navy Arms/A. S. M. 1861 Navy reproduction in .38 Special. Revolver courtesy Navy Arms. Author photo.

The next conversion type was far more practical, since it allowed a conventional rimmed metallic cartridge to be fired and offered an ejection mechanism. This was designed by C. B. Richards and known as the Richards conversion. It was offered by the factory from 1873 through about 1878. With this conversion much of the face of the lock-frame (the standing breech) was machined away to allow a new cartridge conversion plate or "ring" to be fastened with screws into the standing breech, behind the cylinder. Richards cylinders had their back ends (encompassing the entire old percussion nipple area) machined off to expose the rear of the chambers and allowing the cartridges to be inserted from the rear. A novel feature of the Richards conversion was that it used a floating firing pin, mounted within the conversion ring. Just above the firing pin, the conversion rings had their rear sights forged integral with the top surface, at long last eliminating that familiar sighting notch in the hammer which liked to move from side-to-side with the hammer and so often varied the sight picture with each shot. The conversion ring was also provided with a pivoted loading gate that was held open by a spring closure while the gun was being loaded, likewise, this same spring held the gate closed at all other times. Richards alterations also brought a new ejector assembly which was machined to fit into the opening left by the removal of the percussion rammer system, the ejector was then held in place with a cross-screw.

Colt's final percussion conversion was known as the Richards-Mason (for William Mason, father of the Peacemaker.)This version featured a very much more streamlined barrel made without the machine cuts for the old percussion rammer. Mason's new ejector rod (patented in 1872 and also used on the Open-top) fitted into a neat machined channel, right up close and personal with the barrel and was retained by means of a screw passing through the lower barrel, into a machined lug on the ejector tube. Conversion rings on the Mason were now retained

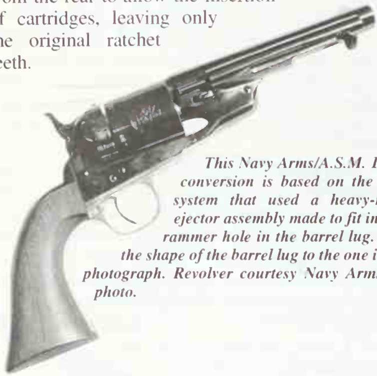


Another Colt, Richards-Mason 1860 Army conversion. Note the odd shaped barrel lug on this gun, the owner suspects this could be a non-factory, gunsmith conversion. From the Walt Penner collection. Author photo.



Close-up of a Colt, Richards-Mason conversion showing the fixed, hammer-mounted firing pin which was easier and less expensive to manufacture than the Richards floating firing pin. From the Walt Penner collection. Author photo.

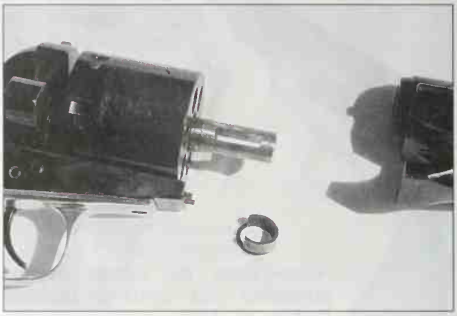
only by the shoulder of the base pin and the floating firing pin was eliminated in favor of a solid pin, mounted on the hammer itself. Richards-Mason cylinder, like the Richards cylinders were machined off from the rear to allow the insertion of cartridges, leaving only the original ratchet teeth.



This Navy Arms/A.S.M. 1861 Navy conversion is based on the Richards system that used a heavy-machined ejector assembly made to fit into the old rammer hole in the barrel lug. Compare the shape of the barrel lug to the one in the first photograph. Revolver courtesy Navy Arms. Author photo.

All of these Colt factory conversions use actions and barrel mounting systems which are identical with their corresponding percussion counterparts. Sometimes people confuse the 1871-72 Colt Open-top as being a percussion conversion but it was actually manufactured as an entirely new revolver that was intended specifically for use with metallic cartridges.

Copies and their individual quirks: Both Cimarron Firearms and Navy Arms are importing Italian-made conversion revolvers made by Armi San Marco that are loosely based on the Richards conversions. At this writing Cimarron has announced that they are discontinuing importation of the A. S. M. manufactured conversion revolvers in favor of those made by Aldo Uberti. Many of the A. S. M. revolvers in .38 caliber will give difficulties during ejection when the rod strikes the sides of the chamber mouths. This annoying fault exists here mainly because the Richards ejector was copied closely from an original revolver in .44 caliber, this places the edge of the ejector rod too close to the inside edge of the smaller caliber's chamber. A serviceable cure for this is to grind an off-set into the side of the ejector rod itself, just the way Colt did it when they chambered the Model P for the smaller calibers.



None of the original conversion revolvers had gas rings to help maintain correct cartridge headspace, this A. S. M. copy does and it is a floating-removable part. Revolver courtesy Navy Arms. Author photo.

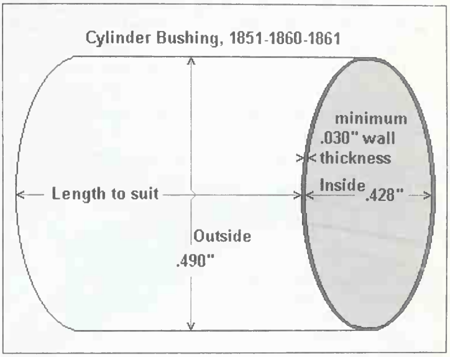
One other objectionable glitch I see very often with the Armi San Marco conversions occurs when the hammers are placed in the loading position; their chambers do not line up with the loading cut in the frames. That means the shooter is forced to manipulate the cylinder in order to make the chambers line up with the loading cut and with the ejector rod, making for a darned slow and sometimes frustrating reload. This is a simple timing problem and you may want to review the chapter covering Troubleshooting the Colt Single Action Army for details of repair.

Some of these replica conversion revolvers can shoot too. This 8" barreled, 1861 Navy Richards conversion from Navy Arms will place five shots into one and three quarter inch groups every time. Revolver courtesy Navy Arms. Author photo.

The 1871-72 Open-top may have looked like a percussion Colt, but it was definitely not a conversion. As this Uberti replica shows, the Open-top's breech was made to fire metallic cartridges. Revolver courtesy Cimarron Firearms. Author photo.

Conversions with excess headspace and under-timing: None of the original conversion Colts used a gas ring to keep the dirty powder fouling from entering into the space between the base pin and the cylinder. On top of that, the only method these guns had for maintaining headspace was when the cylinder slid forward far enough to rub on the back of the barrel. Because of that omission on Colt's part, almost all the original conversion revolvers have excess headspace and so are subject to misfires. The other thing a gas ring would have offered is the idea of holding the cylinder to the rear to maintain headspace also would have kept the ratchet teeth in the proper contact with the hand. A good number of the under-timing problems we see with percussion revolvers and conversions may be traced directly back to the fact that the cylinder moves so far forward that the hand has lost good contact with the ratchet teeth. Colt recognized these as problem areas and corrected them in new production revolvers beginning with the 1872 Open-top by adding a dual-purpose gas ring to the cylinder face. A. S. M. has also added a gas ring to some of its later production conversions as shown in the photo.

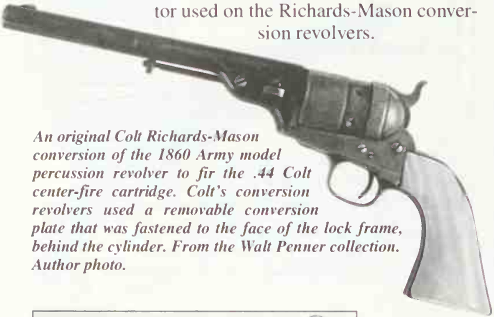
We wouldn't want to alter an original conversion cylinder so drastically as would be required to install a gas ring, but there is something we can do in order to correct that headspace. By making up a floating spacer like the one shown in the illustration, we can effectively push the cylinder back to the rear of the frame and thus lessen the amount of headspace while at the same time putting the ratchet teeth back into their correct relationship with the hand.



Colt's 1871-1872 Open-Top

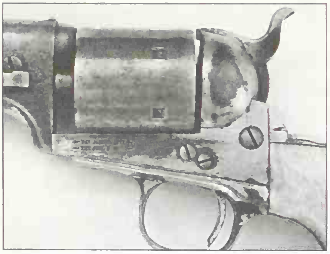
What's an Open-top? In between the time the Smith & Wesson/Rollin White patent covering the use of bored-trough cylinder chambers expired in 1869 and the introduction of Colt's now famous Single Action Army in 1873, Colt produced several unusual metallic cartridge revolvers that used the basic percussion open-topped frame as a platform. Some of them such as the Thuer, Richards and Richards-Mason were conversions of the percussion revolvers which allowed them to use metallic cartridges, however the last such firearm made during this transition period, the one that is actually named the "Open-top" was not a conversion at all, but was made specifically for metallic cartridge use. This revolver was really a combination of the internal workings of the Colt Single Action Army along with the open-top and wedged-on barrel of the cap-n-ball revolvers. What sets it apart from all the earlier conversions from percussion is this revolver did not use a removable conversion plate to allow metallic cartridge use, instead it had a solid-machined breech. For a cartridge ejector the Open-tops used one of William Mason's designs from his 1872 patent which is identical with the ejector used on the Richards-Mason conversion revolvers.

1871-72 Open-tops had a solid machined frame requiring no conversion plate to fire metallic cartridges but it was still a hybrid combination of the yet-to-be SAA and the earlier percussion revolvers. Shown here is the currently manufactured replica by Cimarron Firearms in .45 S&W caliber which is manufactured in Italy by Aldo Uberti. Revolver courtesy of Cimarron Firearms. Author Photo.



An original Colt Richards-Mason conversion of the 1860 Army model percussion revolver to fir the .44 Colt center-fire cartridge. Colt's conversion revolvers used a removable conversion plate that was fastened to the face of the lock frame, behind the cylinder. From the Walt Penner collection. Author photo.

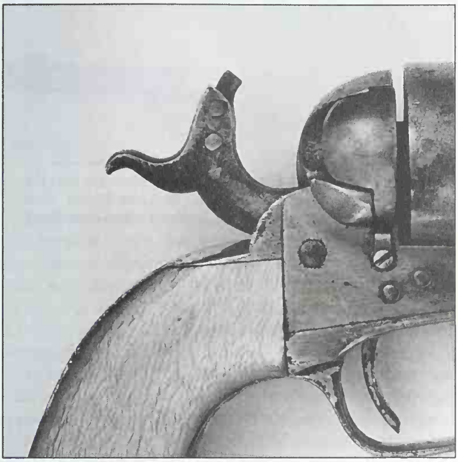
Replica models. About 7,000 of this model were manufactured between 1872 and 1873 and were chambered in .44 Rimfire caliber (.44 Henry), so the idea of shooting an original isn't a real good one, both on account of the gun's rarity and because of a lack of rimfire ammunition. An excellent solution to this has come in the form of a recent introduction from Cimarron Firearms, a replica of this rare and classically beautiful revolver from the frontier days is being manufactured in Italy by Aldo Uberti. Its introduction presents cowboy shooters and collectors with an excellent and shootable modern look-a-like. The new open-top



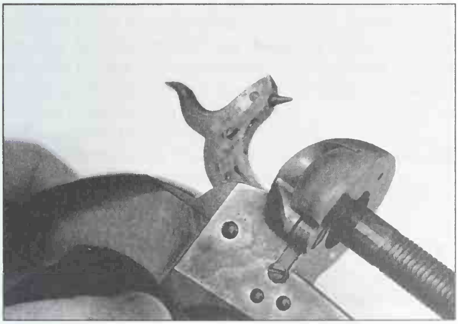
The forerunner of the Model "P", and Colt's first real metallic cartridge revolver the 1871-72 Open-top used a frame that was made specifically for metallic cartridge use (.44 Rimfire.) Notice the similarities to both the future Model P and Colt's percussion pistols. This gun was the immediate predecessor of the Single Action Army, its operation is identical as are many of its internal components. From the Walt Penner collection. Author photo.

Top: An original, and well used Colt 1871-72 Open-top in .44 Henry RF caliber with vintage one-piece ivory grips. Bottom: Cimarron Firearms beautiful new replica of the Colt Open-top is manufactured from modern steels and in calibers that may be purchased off-the-shelf. Revolver courtesy of Cimarron Firearms. Author photo.

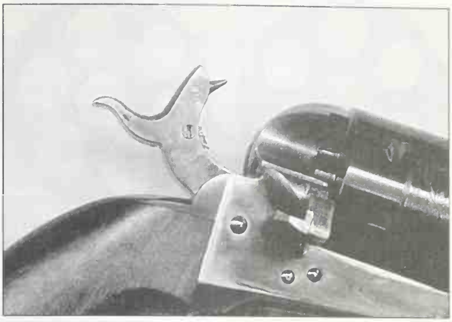
is not chambered in .44 Rimfire but is available in calibers that modern shooters may easily obtain such as 38 Colt-38 Special, 44 Colt BHA, .44 S&W Russian, and .45 S&W Schofield. The Uberti-manufactured open-top has a new hammer-blocking safety device mounted within its hammer. When this safety bar is manually pivoted down to activate the safety feature, it effectively blocks the hammer from traveling all the way forward so the firing pin cannot reach the primer.



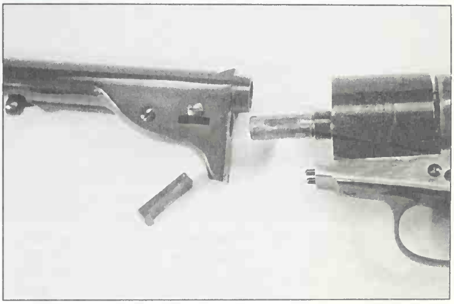
Original Colt Open-tops were chambered in .44 Henry Rimfire caliber, notice the offset firing pin. From the Walt Penner collection. Author photo.



The screw that passes through the hammer's side is the pivot for the Uberti Open-top safety. Here the safety is shown in the "off" position. To put the safety on, the safety bar itself is pivoted forward by pulling out on its top with your thumbnail or a small screwdriver tip causing the safety to rotate all the way around to the front. Revolver courtesy of Cimarron Firearms. Author photo.

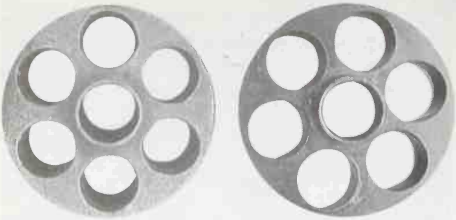


The Cimarron/Uberti Open-top hammer block safety shown in the "on" position. In this position the safety blocks the hammer from falling completely by contacting the frame first. Revolver courtesy of Cimarron Firearms. Author photo.



Shown with its barrel dismounted, notice the gas-ring at the front of this Cimarron Firearms/Uberti made replica Open-top's cylinder. Revolver courtesy of Cimarron Firearms. Author photo.

Gas rings and headspace. Whether original or reproduction, these revolvers use an action whose operation is virtually identical to that of the Colt Single Action Army, while they have a barrel-mounting like that of Colt's percussion or cartridge conversion revolvers. The reader should refer to each of those respective sections for repair information and troubleshooting procedures. Aside from the lack of a conversion-plate, the one major difference between the 1872 Open-top and all other open-topped revolvers is that the Open-top cylinder was fitted with a gas ring. Colt had learned from their earlier conversion revolvers that in order to use metallic cartridges; a fixed cartridge headspace had to be maintained. It was also seen to be necessary that a way be found to help prevent those dirty black powder gases from getting in between the cylinder and the base pin, where the fouling they left often slowed or even stopped the cylinder's rotation.



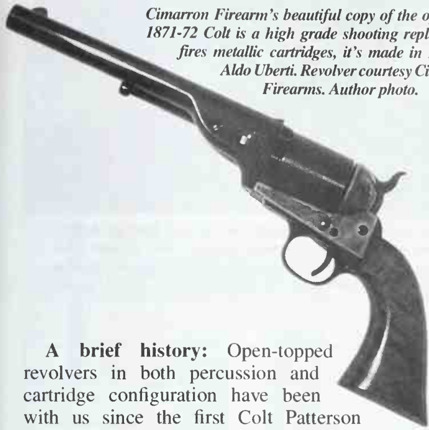
Open-top cylinders viewed from the front. On the left Colt in .44 Rimfire caliber. On the right the Cimarron/Uberti cylinder in .45 S&W Schofield caliber. Author photo.

Smith & Wesson had learned about headspace from their longer experience with cartridge revolvers, and had already taken care of the headspace problem, they then solved this fouling problem by adding a gas ring seal to the face of their Model No. 3 American cylinders. For Colt, the addition of the cylinder gas ring to the Open-top cylinder answered both of those questions; it not only kept most of the gases out of the base pin, it held the cylinder to the rear so that cartridge headspace could be maintained.

Just like the original, Cimarron's replica Open-top uses the ejection system of the earlier Richards-Mason Colt Conversion revolvers and an external, frame mounted loading gate spring.

Some repairs for percussion and other open-top Colts

Here is the *right way* to fit those *cap-n-ball* Colt revolvers.



Cimarron Firearm's beautiful copy of the open-top 1871-72 Colt is a high grade shooting replica that fires metallic cartridges, it's made in Italy by Aldo Uberti. Revolver courtesy Cimarron Firearms. Author photo.

A brief history: Open-topped revolvers in both percussion and cartridge configuration have been with us since the first Colt Patterson revolver of 1836. A highly successful design, it fought a major U.S. war, several foreign wars, lasted throughout the percussion era and even continued for a short time into the cartridge era in the Colt cartridge conversions and the 1871-1872 Open-Top cartridge revolvers. Untold thousands of recently manufactured Colt open-top percussion copies of various quality also exist, and in recent times, in cartridge form. Those latter-day replicas have from the start been very popular with civil war reenactors and later, at cowboy events ever since Navy Arm's Val Forgett first began their importation back in the 1950s.

The actions these revolvers make use of are nearly identical to the more familiar Colt Single Action Army. Because the Peacemaker was designed using the same action as its percussion forefathers, the methods we will use to adjust and repair this area of Colt percussion revolvers are similar. What is very different from the solid-framed Single Action Army is Colt's method of attaching the percussion or open-top barrel to the frame, therefor we must use radically different methods for their repair. Many objections to these revolvers have been raised, they are condemned by some for the lack of a top-strap and for their crude barrel fastening method; which is a simple tapered steel wedge. However many people dislike the design, these revolvers were intended for quick disassembly and reloading with a spare cylinder; a purpose for which it is unexcelled. Most of the world happily accepted it and put it to good use long before it knew something better would be available. Those Colt revolvers were gorgeously made, and their wonderful craftsmanship made up in some degree at least, for any inherent weakness in the open-topped design. Some of the modern replicas of the Colt have been rather poorly made, but some others, especially those being produced by Uberti and Colt Black Powder Arms, are nearly as well crafted as the originals and it can sometimes be difficult to tell them apart from an original.

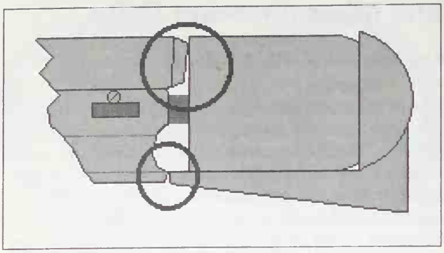
Colt's open-topped revolvers used a wedge to secure the barrel onto a strong cylinder arbor which was tightly fastened to the lock frame. This is an Uberti replica of the Colt Model 1874 Walker .44 with its cylinder removed, note the massive cylinder arbor. Author collection and photo.

It is because of this unique method of barrel fastening that we sometimes find these Colts, and their modern copies with their own unique set of problems: loose barrels and loose wedges, and sometimes barrels that bind on the cylinders if the wedge is pushed in all the way. All these problems could have been caused by severe wear or abuse, or maybe even by some gunsmith or tinkerer who, not being familiar with the odd characteristics of these revolvers, could easily have mis-fitted the barrel to the frame. How are the barrels supposed to fit on the frames?

Here's the wrong way: the most common mistake is that of trying to make a loose barrel 'tighter' by removing material from the front face of the base pin

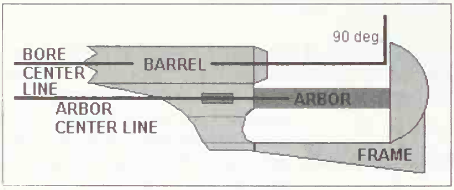
Dave's Tips

A brief history
The right and the wrong way
Arbor removal
Stretching an arbor
Making an arbor
Barrel/cylinder gap and end-shake
Re-fitting a wedge
About replacement parts

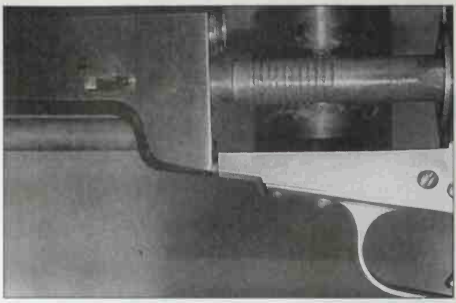


or cylinder arbor; this allows the wedge to pull the barrel back farther onto the cylinder arbor. However, inevitably what this action does is to cause the barrel to point slightly up, by causing the lower barrel leg of the barrel to bind on the frame's front at the barrel seat, and at the same time closing up the barrel-to-cylinder gap at an angle. Look over the illustration for an exaggerated look at what actually happens when this is done.

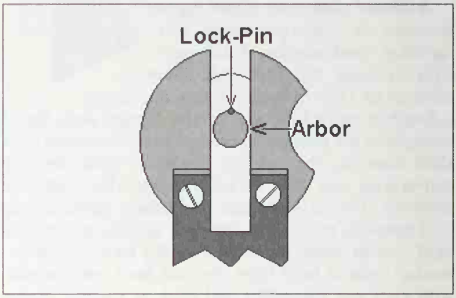
Now the right way: To make an open-top Colt barrel fit correctly with its frame, and it makes no difference whether the pistol is a reproduction or an original Colt, in either percussion or metallic cartridge conversion: there is a parallel line that has to be maintained between the center-line of the barrel's bore and the center-line of the base pin, or cylinder arbor. The entire process will hinge on that arbor, that is the key to correctly fitting the open-top Colt. If the situation were ideal, the wedge



would push on the rear of its slot in the barrel and also on the front of its slot in the cylinder arbor, this causes the barrel to be pulled to rearward, where the front face of the cylinder arbor should butt up solid, right against the arbor's seat within the barrel. That condition will prevent any further rearward barrel movement. The contact is intended to occur at the exact point when the barrel leg has made contact with the barrel seat at the front of the frame so there is little or no air gap visible between that barrel leg and the front of the frame where those two barrel locating pins are.



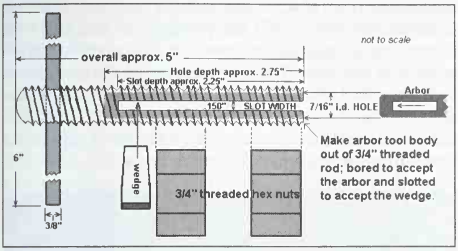
Here in the center of the photo, on the very front of the lock frame are the barrel locating pins as they fit into their alignment holes in the barrel. Notice also the "grease grooves" in the base pin (the cylinder arbor.) Author photo.



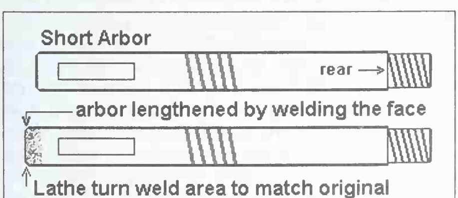
Both the integrity and the strength of this fit are achieved in the arbor-to-barrel connection and that is finally secured by a proper fitting wedge. The mate of the barrel leg with the front of the frame is a secondary consideration and not the reverse as many think or believe. Note that it is also important the barrel be a snug "push fit" over the arbor, if you have a loose fit here it will work against all other attempts to properly fit the barrel/arbor assembly.

Removing an arbor: If the revolver you have has the condition which is shown in the illustration above, you will first want to remove the barrel and the cylinder to check the arbor and see if it is tight in the frame. These arbors are screwed in quite tightly, and there is a lock pin driven in from the rear where the threads and the frame intersect to prevent the arbor from ever unscrewing. Colt used to use a tapered pin but I have seen everything from soft lead to threaded holes with set screws used as locking methods. If you find the arbor is loose, there is no way around this, it will have to be unscrewed to be either replaced or repaired. Remember, before it can be unscrewed that lock pin or screw has to be removed or the arbor will never come out. This usually will mean

having to drill out the lock pin. Drilling should be done on a line parallel with the bore, and normally a drill size of approximately .090" will remove all trace of the lock pin. After I am done fitting the new, or have repaired and re-installed the old arbor, I re-drill the lock-pin hole with a #31 drill bit, and bottom tap the hole for #6-48 thread screw (with smaller .31 caliber frames, an appropriate screw size would be a #5-44.) If you will shorten a plug screw to fit in the hole so that the head is just below being flush, you will have a neat, and permanent repair that has the attribute of being removable, and a future gunsmith may thank you for your efforts.

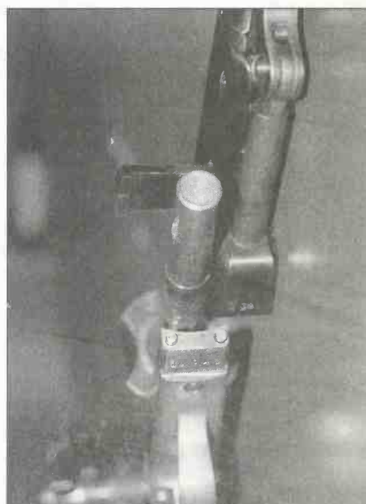


If you have determined that the face of the cylinder arbor is too short to allow it contact with the arbor seat, the cure is to use a cylinder arbor with a longer 'face' so that the barrel can be refitted correctly to the arbor and to the frame. You may change the arbor for a new part to do this (should the outside diameter of the arbor front be too small for the arbor-hole in the barrel then you must install, or make a new part.) You may be able repair the existing part by causing it to 'grow' longer by adding metal to the front face. When the gun has an arbor that is otherwise well fitted, the preference is to try to repair that arbor, this can save a lot of fitting work. Whatever you do, the old arbor must first be unscrewed and removed from the frame. Make note of the *timing position* of the arbor slot before you remove it; slot openings should face three and nine o'clock, in other words; exactly horizontal after the arbor is tightly installed. The removal of the tight arbor can be a chore, but this can be eased by the use of tools such as are shown in the illustration.

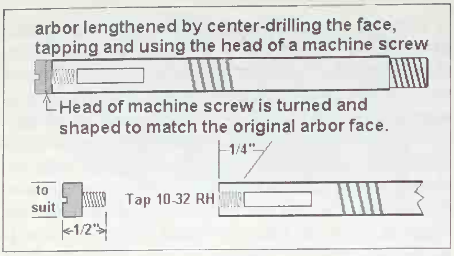


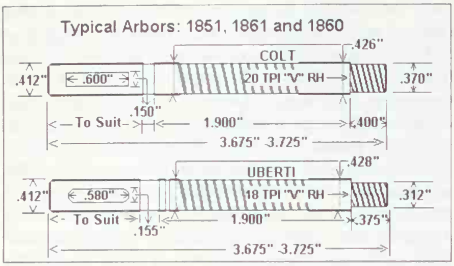
How to stretch an arbor:

There are a couple of good ways to lengthen a cylinder arbor and help restore the correct barrel to frame fit. As shown in the illustration, you may weld up the front face of the arbor (try Brownell's 3 % nickel steel welding rod, it works well for this kind of operation.) If you weld, be careful so that you don't allow too much heat to get back into that hardened, slotted area of the arbor. After the weld, you would lathe turn the arbor face back into a configuration that matches the original arbor shape, albeit somewhat longer to allow the room for barrel fitting. Or, there is another old trick that involves no heat, where you lathe square and then center-drill the arbor face in to a depth of about one-quarter inch, then drill and tap the new hole to accept a #10-32 thread. Many of the factory arbors, especially the Colts will be very hard so before any machining can be done you will have to anneal about the front quarter inch of the arbor, taking care so that you don't allow the heat to spread back into the slotted area, which of course we want to leave in a hard state. We will have previously made a special screw with a head diameter that is the same size as the outside diameter of the arbor. Now we fit the specially made #10-32 thread screw into our newly drilled and threaded arbor's face, installing it tight along with a few drops of Loc-Tite as insurance that the screw will remain in place. That finished, the arbor is chucked in the lathe and the screw head is then turned down to match the original configuration, in the process removing the screw slot as we turn off the excess metal.



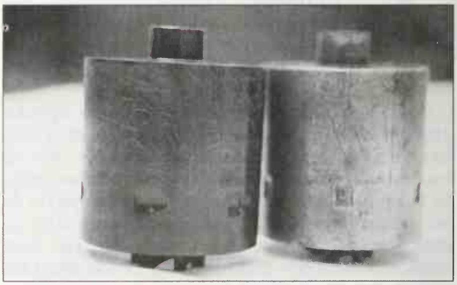
The front face of the arbor (here painted white for identification) is what the barrel should seat against positively. Below it you can see the barrel locating pins at the front of the lock frame. Author photo.





Making a new arbor: With some revolvers, especially those that have severe abuse, you might just decide that a new arbor is what is needed. Sometimes a suitable replacement cannot be found, or a special oversize may be required, so making a new arbor will be the only alternative. In that case, you can machine a new arbor from drill rod to approximately the specifications shown in the illustration, which gives the more common arbor which is used in the 1851 and 1861 Navy as well as the 1860 Army models. Of course the dimensions will have to be varied in order to suit the specific revolver in your shop. If you are going to manufacture a new arbor, you may find it beneficial to increase the diameter of the bearing surfaces at the cylinder axles, this can help compensate for any wear present in the cylinder bore itself. After you have the new arbor made and completely fitted, it is wise to harden, and then temper the arbor to roughly 50-51 on the Rockwell "C" scale before its final installation. Grease grooving: These funny little grooves are not only functional but necessary on black powder revolvers of this type. The grooves hold the thick grease to lubricate the cylinder axle and seal out the filthy combustion gases. Without the grooves the black powder residue would soon foul the cylinder axle and cause the cylinder to seize up. You may lathe turn grease grooves fairly easily. Note that they are right-handed, shallow and square profile threads with a pitch of about 18 to the inch. The major diameter of these square threads can be anywhere from two to six thousandths of an inch smaller in diameter than the axle bearing surfaces that the cylinder actually turns on, the "thread" minor diameter should be about six thousandths of an inch smaller than the major diameter.

The final step is to re-install the arbor, and slowly, squarely remove metal from its new front face until the barrel slides back and its leg almost comes into contact with the frame face at the barrel seat. As a rule, I leave a gap of five ten-thousandths of an inch to one-one thousandth of an inch in between the rear face of the barrel leg and the front of the frame face. A small gap like this is hardly noticeable, but the presence of this gap will insure a small amount of room for the barrel to "seat" rearwards into the arbor in the future, as the gun wears from use and from future dis-assemblies. When the arbor-to-barrel connection is fitted perfectly, you will not be able to drive the wedge in so far that it causes the barrel to cylinder gap to close at an angle.

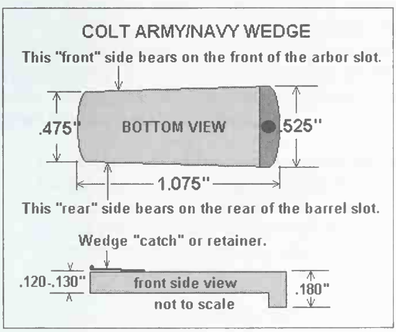


Colt's only open-top revolvers which used cylinder gas rings where their first real cartridge pistols, the 1871-72 Open-tops in .44 rimfire caliber. In the foreground is a modern Cimarron Open-top replica cylinder just to the left of the original Colt. Notice they are each equipped with gas rings.

Barrel/cylinder gap and cylinder end-shake: These Colt open-top type pistols are well known for having a large degree of cylinder end-shake (front to rear movement) as well as much bigger barrel-to-cylinder gaps than we are used to seeing with modern revolvers. Some degree of cylinder end-shake is inherent in this design, and so is a fairly large barrel/cylinder gap. With black powder pressure levels in cap-n-ball revolvers, or even with low power smokeless cartridges in replica conversion pistols, we can live with what would be too much of both in more modern cartridge revolver designs. Some of this barrel-to-cylinder gap if it is deemed to be excessive, as well as at least some of the cylinder end-shake might be removed by moving the arbor seat to the rear (in other words, by shortening the arbor from its front end); just as long as the barrel seat were shortened by a like amount so the barrel would remain squarely mated with the frame as described earlier. How much is *too much* barrel-to-cylinder gap? I

like to say "shoot the gun first and make up your mind." Years back I used to own an original 1851 Navy Colt that would put 6 round balls so close together that they were almost one on top of the other at 50 feet. This particular gun had about a forty-thousandths of an inch gap in between the cylinder face and the rear of the barrel, but otherwise it was fine mechanically. Forty thousandths of an inch is thirty two thousandths larger than what is termed the "maximum" allowed gap, but this gun never shaved lead.

Re-fitting the barrel wedge. Now that you have the barrel fitted properly to the arbor-frame assembly, what we need to do is to find a method to hold it right where it is. That would be the wedge. The wedge is an ancient holding device that was used on firearms even in their earliest forms but the wedge had been in service for countless other mechanical uses over the millennia. For this purpose, the wedge is a tapered, rectangular piece of flat steel with a pronounced step or shoulder on its large end, often with a spring loaded catch riveted onto a non-bearing surface that can act as a retainer; preventing the wedge from slipping out of its slot pushed by its taper, which would be the natural tendency. With the wedge fully installed, the hook on the wedge "catch" or retainer is meant to lock over the outer edge of the inboard barrel slot. Conversely, when the wedge is pushed out of the barrel; the retainer hook is meant to catch on the inner edge of the wedge screw, located at outboard barrel slot.



This is what "should" happen when the wedge is installed; the rear flat-bearing surface of the wedge contacts the rear flat of the wedge slot in the barrel, while a portion of the front bearing surface of the wedge contacts the rear flat of the arbor's slot: this effectively pushes the barrel to the rear while holding the barrel's arbor seat into tight contact with the front of the arbor. When the wedge is so small that it easily seats with thumb pressure (meaning it's not wide enough front to rear), leaving you with a slightly loose barrel, you should either replace the wedge with a larger part or build the wedge's rear flat-edge up

Uberti's 1871-72 Open-top uses a neat arrangement to hold the wedge; the screw's head fits into a lock-slot machined in the wedge's top side, to remove the wedge, the wedge screw must first be turned so the flat part of its head faces the wedge. Revolver courtesy Cimarron Firearms. Author photo.

with weld and file it down to suit the requirements of your project revolver. Too large or "wide" a wedge may be fitted by filing only the rear flat-face until you have very close fit, that edge should be finish fitted to a fine matte luster using a hard Arkansas stone.

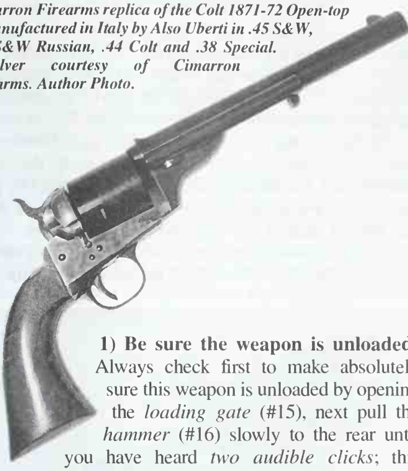
How tight is "tight"? Ideally, you should be able to start the wedge into the slot and push it about 75-85% of the way through the barrel using only your thumb. A light tap with a small plastic or wooden mallet is all that should be required to final seat the wedge to the desired point. What is the desired point? Just how far should the wedge go into the barrel? When perfectly fitted, after the light tap I just described; the shoulder of the wedge should not quite contact the barrel side (in some cases the wedge will contact the head of the wedge screw before the shoulder contacts the barrel), the shoulder should contact the barrel side (or wedge screw) only with resistence. In other words, when it is driven farther in only by using a harder than normal blow. Your bottom line: If you have the barrel fitted correctly to the arbor and frame; the barrel should not ever be able to be bound against the cylinder, nor should it be susceptible of being pulled off center by the wedge, even when that wedge has been driven in "too far".

Replacement parts? Good quality replacement parts for replica open-top types may be purchased from the parts department at Uberti USA (P.O. Box 459, Lakeville, CT 06039, (860) 435-8068.) Excepting in those cases where extreme wear is present, some Uberti replica parts can be adapted to suit original Colts as well as other makes of replicas. Unfortunately, the 1851/1861 Navy-1860 Army size arbor as made by Uberti uses a different, and smaller frame thread than the Colt and it cannot be used on original guns. However, I have seen many Uberti wedges successfully fitted to Colt revolvers.

Base Pin (arbor)	Uberti Part #	Wedge	Uberti Part#
1848-49 .31 pockets	031021	1848-49 .31 pockets	070004
1862 .32 pocket	070021	1862 .32 pocket	070004
1851-60-61 models	000021	1851-1860 models	000004
Walker	020021	Walker	020004
1st-3rd Dragoon	080021	1st-3rd Dragoon	080004
Patterson	090021	Patterson	090004

Uberti 1872 Open-top Single Action Revolvers

Takedown instructions



Cimarron Firearms replica of the Colt 1871-72 Open-top is manufactured in Italy by Also Uberti in .45 S&W, .44 S&W Russian, .44 Colt and .38 Special. Revolver courtesy of Cimarron Firearms. Author Photo.

1) Be sure the weapon is unloaded! Always check first to make absolutely sure this weapon is unloaded by opening the *loading gate* (#15), next pull the *hammer* (#16) slowly to the rear until you have heard *two audible clicks*; this should have placed the hammer in the *half-cock or loading position* and the *cylinder* (#14) should spin freely in a clock-wise direction. *Keep your fingers away from the trigger* during this entire operation! Slowly *rotate the cylinder two full revolutions* by hand, all the while examining the cylinder's chambers through the opening that has been presented by the opened *loading gate* at the rear of the frame (#12) to make absolutely certain that the cylinder chambers have no cartridges in them.

1a) What if cartridges are present? ***This is a loaded gun!*** Leave the hammer right where it is: In the half-cock or loading position and with the loading gate opened. Using your left hand to hold the revolver securely by the grip, still *keeping your fingers away from that trigger*; tilt the revolver so that the barrel's muzzle (front) is facing away from you and upwards; in a direction that you determine is safe (so that if the gun did accidently fire no one would be injured.) Now, use your right hand to rotate that cylinder slowly, one chamber at a time; ***pausing at each audible click to allow each successive cartridge to fall out of its chamber*** and onto your workbench. If any cartridge will not fall out of its own weight; manually operate the ejector by pushing the *ejector rod head* (#6) located under the front of the barrel) to the rear with your right hand until the ejector rod has forced that cartridge out of the chamber. When you are absolutely certain that there are no more cartridges left in the cylinder chambers, the revolver may now be safely disassembled.

In order to remove the wedge, the wedge-lock screw must first be turned until its "flat" side is facing down. Revolver courtesy of Cimarron Firearms. Author Photo.

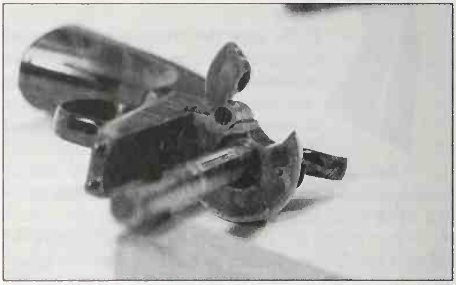
2) Barrel and cylinder removal: The *barrel* (#1) may be separated from the *frame* (#12) by turning the wedge lock screw (located just over the wedge on the left side of the barrel) until its flat aligns with the wedge, and then pushing the *wedge* (unnumbered) out toward the left side of the barrel as far as it will move. Some of these barrel wedges are equipped with a *wedge lock spring* (unnumbered) with a lock that grasps the right side of the barrel so before the wedge can be moved this lock must first be depressed. If the wedge is so tight that it will not move by hand pressure, you may use a small nylon (nylon is used in order to lessen the chance of damaging either the wedge, or the surrounding metal) drift punch with a hammer to break the wedge free. Place the *hammer* (#16) in the loading position so that the cylinder will spin freely. The *barrel* may now be removed from the *frame* by pulling it straight forward. The *cylinder assembly* (#14) is likewise removed from the frame by pulling it straight forward, off the *cylinder pin* [a.k.a.: *base pin*] (unnumbered.)

3) Grip and grip strap removal: These revolvers are equipped with ***one-piece grips*** and are disassembled thusly: Remove the two *back-strap screws* (#39) from the top-rear of the *back-strap* (#1) and remove the single *butt-screw* (# 35) from the butt of the *back-strap*. The *back-strap* (#38) and the one piece *grip* (#42) may be removed by pulling them down and to the rear as a unit. Once off the frame, the *grip* (#42) itself may be rocked down from the top slightly and then pulled straight forward off the *back-strap*. Remove the *mainspring screw* (#36) from the inside-lower area of *trigger guard* (#31.) The *mainspring* (#37) will now lift out. Remove the two *trigger guard screws* (#33) and the front *trigger guard* screw (#32) and the trigger guard (#31) will remove from the bottom.

4) Action disassembly: Remove the *bolt spring screw* (#29) [this is the only screw facing straight up] from the underside of the frame and the *trigger/bolt spring* (#28) will fall out the bottom of the frame. Next, remove the *forward-most* of the three screws on the left side of the frame, this is the *bolt screw* (#26) which holds the *bolt* (#25) in place, the *bolt* may now be removed from the bottom. Be sure to keep the *bolt screw* (#26) with the *bolt* (#25) while they are removed because the *trigger screw* (#26) may easily be mistaken for the *bolt screw* which is slightly shorter. Now remove the *trigger screw* (#26) and the *trigger* (#27.) The *hammer screw* (#30) may now be removed, after which the *hammer assembly* (#16) may be rotated slightly to the rear and pulled down and out of the frame. The *hand assembly* (#21) is connected to the *hammer* and will withdraw with it. Once the *hammer assembly* (#16) is out, the *hand assembly* (#21) may be removed by lifting it up out of its socket hole on the left side of the hammer.

5) Peripheral disassembly: The *ejector rod tube screw* (#3) is removed from the left side of the barrel (located just forward of the wedge. The entire *ejector rod tube assembly* may be pulled off to the left side until it moves away from the barrel. The ejector rod (#5), may be unscrewed from the ejector rod head (#6) and the rod will remove out through the rear of the ejector tube. The ejector rod head (#6) may be pulled out the side of the opening in the ejector tube and the spring (#4) will now be free to slide out the front of the ejector tube. Loading gate; Remove the *loading gate spring screw* (located just under the closed loading gate) and withdraw the loading gate spring by pulling it down. Within the cylinder opening of the frame under the loading gate is the gate screw. Remove the *screw* (unnumbered) and the *loading gate* (#15) itself may now be removed by pulling it forward off the front of the frame.

This view shows the Open-top's "loading gate spring screw" and the "loading gate spring" on the right side of the frame, just below the gate. Revolver courtesy of Cimarron Firearms. Author Photo.



The loading gate itself is retained by the loading gate screw. Access to this screw may only be gained by first removing the barrel and the cylinder. Revolver courtesy of Cimarron Firearms. Author Photo.

Reassemble the revolver in the reverse order.

Colt and Colt type percussion revolvers (other than Paterson)

Takedown instructions

Uberti 1851 Navy parts nomenclature is used in the text.

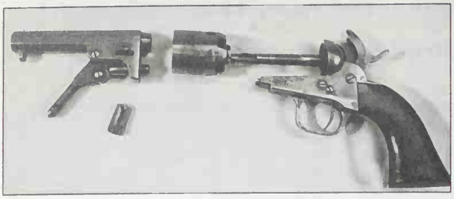
With only minor variations, the following instructions can be suitable for use with nearly all of the percussion ignition, open-top frame, Colt type revolvers based on the Dragoon, 1848, 1849, 1851, 1860 and 1861 models.

1) Be absolutely sure the revolver is not loaded! Always place the hammer in the loading position and check to be certain that the revolver's cylinder is unloaded before attempting any disassembly or before handling the revolver. Perform this check by carefully examining the rear of the cylinder at each chamber to be certain that; A) there are no percussion caps on any of the nipples. If percussion caps are present on the nipples you should consider this a loaded firearm; *do not attempt any further disassembly,* and B) you should always look at the front of the cylinder to make sure that there are no charges in the cylinder chambers (a good indication that a chamber is most likely loaded would be if bullets or balls showing at the front end of the chamber.) A loaded cylinder may be emptied by taking the gun to a range and firing it until it is empty or it may be carefully removed without firing the revolver in order to render the revolver safe for further operations by following the instructions below.

Wedges on the Colt Walker revolvers are removed from the right side of the barrel. Author photo.

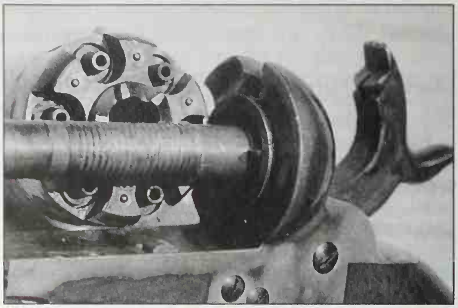
To free the Colt percussion barrel, the wedge is first withdrawn out the left side of the barrel. Revolver courtesy Cimarron Firearms. Author photo.

2) Barrel and cylinder removal: The *barrel* (#3) may be separated from the *frame* (#1) by pushing the *wedge* (#4) out toward the left side of the barrel as far as it will move. Some barrel wedges are equipped with a *wedge lock spring* (#17) with a lock that grasps the right side of the barrel and before the wedge can be moved this lock must first be depressed. If the wedge is so tight that it will not move by hand pressure, you may use a small nylon (nylon is used in order to lessen the chance of damaging either the wedge, or the surrounding metal) drift punch with a hammer to break the wedge free. Place the *hammer* (#2) in the loading position so that the cylinder will spin freely. If the revolver is equipped with a *rammer* (#13), turn the *cylinder* (#5) so that the *rammer pin* (#24) will contact the cylinder in-between two chambers, then operate the *rammer* in so that the barrel loosens and moves forward from the frame forward slightly. The *barrel* may now be removed from the *frame* by pulling it straight forward. The *cylinder assembly* (#5) is likewise removed from the frame by pulling it straight forward, off the *cylinder pin* [a.k.a.: base pin] (#21.)



On all percussion Colts the barrels and cylinders are withdrawn off the front of the base pin or "arbor" as shown here with this 1849 Pocket replica. Revolver courtesy Cimarron Firearms. Author photo.

Once the wedge has been withdrawn, the rammer may be placed between two chambers and used as a lever to push the barrel forward. Revolver courtesy Cimarron Firearms. Author photo.



The 1851 Navy frame shown is a modern-made replica by Uberti. Notice the recessed area at the front of the frame on the recoil shield? This is to provide clearance for the nipples as the cylinder rotates. Author's collection and photo.

3) Barrel and cylinder disassembly:

Remove the *rammer pin screw* (#34) from the *rammer* and if so equipped remove the *rammer screw* (#39) from the left side of the *barrel* (1860 Army/1861 Navy types do not use a rammer screw but have male cogs on their tops which engage female gear teeth on the underside of the barrel.) The *rammer* (#13) and its *rammer pin* (#24 may be removed from the front. The *wedge* (#4) may be removed from the barrel by first removing the *wedge screw* (#33) from the left side of the barrel and then withdrawing the wedge. The only disassembly that will be required, or that is indeed possible on the *cylinder* (#5) would be the removal of the *percussion nipples* (#14) and this step should be accomplished with a special tool called a *nipple wrench*. Percussion nipples are screwed in and have right-hand threads, this means that they unscrew in a counter-clockwise direction. Original Colt and other vintage percussion revolvers may have nipples which have been hand fitted to each specific chamber and care should always be taken that these are re-installed in exactly the chamber they were removed from.

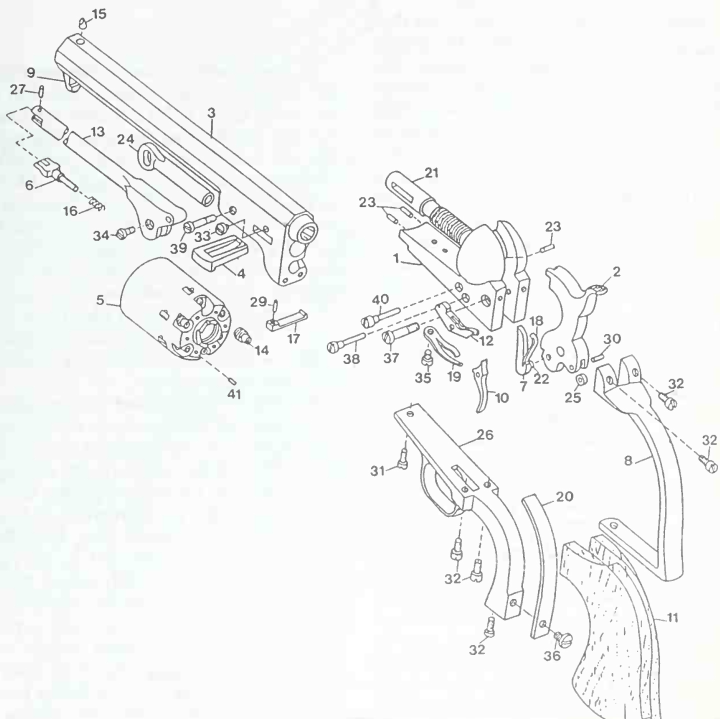
4) Grip and grip strap removal: 4a} If the revolver is equipped with **two-piece grips**; first remove the grip screw from the center of the grip and then remove the two grips, now proceed to step 4b. In the great majority of cases however, these revolvers will be equipped with ***one-piece grips*** and are disassembled thus: 4b} Remove the two *back-strap screws* (#32) from the top-rear of the *back-strap* (#8) and remove the single *butt-screw* (# 32) from the butt of the *back-strap*. The *back-strap* (#8) and the one piece *grip* (#11) may be removed by pulling them down and to the rear as a unit. Once off the frame, the *grip* itself may be pulled straight forward off the *back-strap*. Remove the *mainspring screw* (#36) from the inside-lower area of *trigger guard* (#26). The *mainspring* #20) will now lift out. Remove the two *trigger guard screws* (#32) and the *front trigger guard screw* (#31) and the *trigger guard* (#26) will remove from the bottom.

5) Action disassembly: Remove the *trigger and bolt spring screw* (#35) [this is the only screw facing straight up] from the underside of the frame and the *trigger and bolt spring* (#19) will fall out the bottom of the frame. Next, remove the *forward-most* of the three screws on the right side of the frame, this is the *bolt screw* (#40) which holds the *bolt* (#12) in place, the *bolt* may now be removed from the bottom. Be sure to keep the *bolt screw* (#40) with the *bolt* (#12) while they are removed because the *trigger screw* (#38) may easily be mistaken for the *bolt screw* (#40) which is shorter. Now remove the *trigger screw* (#38) and the *trigger* (#10). The *hammer screw* (#37) may now be removed, after which the *hammer assembly* (#2) may be rotated slightly to the rear and pulled down and out of the frame. The *hand assembly* (#7) is connected to the *hammer* and will withdraw with it. Once the *hammer assembly* (#2) is out, the *hand assembly* (#7) may be removed by lifting it up out of its socket hole on the left side of the hammer.

Reassemble the revolver in the reverse order.

Parts for the Percussion Colt types (Uberti 1851 Navy nomenclature)

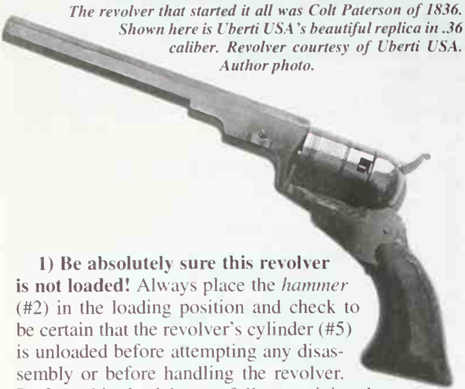
1. Frame
2. Hammer
3. Barrel
4. Wedge
5. Cylinder
6. Loading lever latch
7. Hand assembly
8. Barrel stud
9. Backstrap
10. Trigger
11. Grip
12. Bolt
13. Loading lever assembly
14. Nipple
15. Sight
16. Loading lever latch spring
17. Wedge spring
18. Hand spring
19. Trigger bolt spring
20. Mainspring
21. Base Pin (arbor)
22. Hand spring pin
23. Barrel pin
24. Plunger
25. Roller
26. Triggerguard
27. Loading lever latch pin
28. None
29. Wedge pin
30. Roller pin
31. Front triggerguard screw
32. Rear backstrap screw
33. Wedge screw
34. Plunger screw
35. Trigger bolt spring screw
36. Main spring screw
37. Hammer screw
38. Trigger screw
39. Loading lever screw
40. Bolt screw
41. Cylinder pin



Colt Type Paterson Percussion Revolvers

Takedown instructions

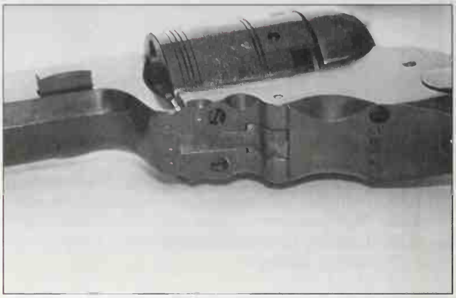
Uberti Paterson parts nomenclature is used in the text.



The revolver that started it all was Colt Paterson of 1836. Shown here is Uberti USA's beautiful replica in .36 caliber. Revolver courtesy of Uberti USA. Author photo.

1) Be absolutely sure this revolver is not loaded! Always place the *hammer* (#2) in the loading position and check to be certain that the revolver's cylinder (#5) is unloaded before attempting any disassembly or before handling the revolver. Perform this check by carefully examining the rear of the cylinder at each chamber to be certain that; A) there are no percussion caps on any of the nipples (#14.) If percussion caps are present on the nipples you should consider this a loaded firearm; *do not attempt any further disassembly*, and B) you should always look at the front of the cylinder to make sure that there are no charges in the cylinder chambers (a good indication that a chamber is most likely loaded would be if bullets or balls showing at the front end of the chamber.) A loaded cylinder may be emptied by taking the gun to a range and firing it until it is empty *or it may be carefully removed without firing the revolver* in order to render the revolver safe for further operations by following the instructions at 2) below.

2) Barrel and cylinder removal: The *barrel* (#3) may be separated from the *frame* (#1) by pushing the *wedge* (#4) out toward the left side of the barrel as far as it will move. If the wedge is so tight that it will not move by hand pressure, you may use a small nylon drift punch (nylon is used in order to lessen the chance of damaging either the wedge, or the surrounding metal) with a small hammer to break the wedge free. Place the *hammer* (#2) in the loading position (pull it back until the first "click" is heard) so that the *cylinder* (#5) will spin freely. If the revolver is equipped with a loading lever (#13), turn the *cylinder* (#5) so that the *rammer pin* (#24) will contact the cylinder in-between two chambers, then operate the *rammer* in so that the barrel loosens and moves forward from the frame forward slightly. The barrel may now be removed from the *frame* by pulling it straight forward. The *cylinder assembly* (#5) is likewise removed from the frame by pulling it straight forward, off the *base pin* (#21) [Colt called this an arbor.]



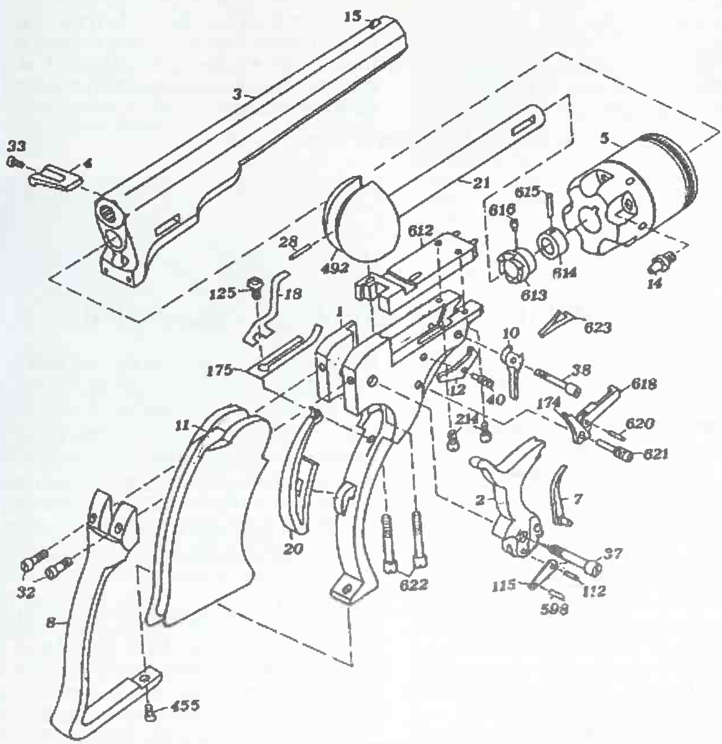
Colt Paterson triggers were folded up into the lock frame when not in use. Author photo.

3) Barrel and cylinder disassembly: The *wedge* (#4) may be removed from the barrel by first removing the *wedge screw* (#33) from the left side of the barrel and then withdrawing the wedge. The only disassembly that will be required on the *cylinder* (#5) would be the removal of the *percussion nipples* (#14) and this step should be accomplished with a special tool called a *nipple wrench* (available from the manufacturer). Percussion nipples are screwed in and have right-hand threads, this means that they unscrew in a counter-clockwise direction. Original Colt and other vintage percussion revolvers may have nipples which have been hand fitted to each specific chamber and care should always be taken that these are re-installed in exactly the chamber they were removed from.

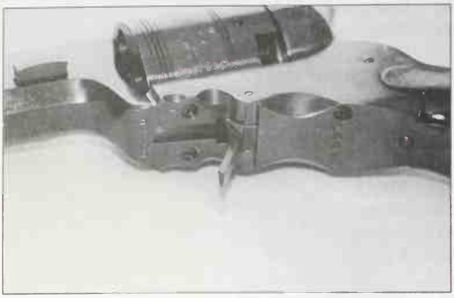
4) Grip, grip strap and mainspring removal: Pull the hammer (#2) all the way to the rear and hold it with your thumb, pull the trigger (#10) and allow the hammer to ease all the way forward, slowing it with your thumb. Remove the two *back-strap screws* (#32) from the top-rear of the *back-strap* (#8) and remove the single *connect screw* (#455) from the butt of the *back-strap*. The *back-strap* (#8) and the one piece *grip* (#11) may be removed by carefully pulling them down and to the rear as a unit. Once off the frame, the *grip* itself may be pulled down slightly at the top to separate it slightly from the *back-strap* and then straight forward off the *back-strap*. The *mainspring* (#20) must be detached from the mainspring seat and this is done by pressing down and forward on the lower portion of the mainspring using both thumbs. The spring should compress

Parts for the Paterson revolver
(Uberti parts nomenclature, without loading lever)

1. Frame
2. Hammer
3. Barrel
4. Wedge
5. Cylinder
7. Hand
8. Backstrap
10. Trigger
11. Grip
12. Bolt
14. Nipple
15. Sight
18. Hand spring
20. Main spring
21. Base Pin (arbor)
28. Cylinder lock pin
32. Backstrap screw
33. Wedge screw
37. Hammer screw
38. Trigger screw
40. Bolt screw
112. Stirrup plug
115. Stirrup
125. Hand & sear spring
174. Sear
175. Sear spring
214. Frame plate screw
455. Connect Screw
492. Breech
598. Stirrup pin
612. Frame plate
613. Toothed rack
614. Toothed rack link
615. Toothed rack link pin
616. Toothed rack latch
618. Sear lever
620. Sear pin
622. Breech screw
623. Trigger spring



slightly and slide down far enough to unhook from the seat. The mainspring is now free at the bottom and may be unhooked from the stirrup (#115) and taken.



As the Paterson hammer was pulled to the rear, the trigger automatically unfolded. The screw behind the trigger is the lower breech screw. Author photo.

5) Action disassembly: Carefully note the positioning of all parts for reassembly. Remove the *two breech screws* (#622) one runs straight up from the bottom of the frame just behind and to the left of the trigger, the other runs up at an angle and may be accessed inside the right hand grip circle at the lower rear of the frame. The Breech assembly with the base pin attached may be removed by pulling it straight up, off the frame. Further disassembly of the breech is not recommended except by a skilled gunsmith *{the toothed ratchet is removed by first drifting out the toothed rack link pin (#615) and then sliding the toothed rack link and then the toothed rack itself forward off the base pin (#21.)}* Remove the hand and sear spring screw (#125) and pull the sear spring straight out through the rear of the frame. Remove the hammer screw (#37) and lift the hammer (#2) straight up out the top of the frame, the hand (#7) will come with it.`The hand spring (#18) may now be lifted up out of the frame opening.

6) Bolt and trigger disassembly: The two frame plate screws (#214) may now be removed from the bottom-front of the frame and the frame plate (#612) is lifted straight up off the frame, exposing the bolt and trigger mechanisms. The trigger spring (#623) may now also be lifted up and out of its seat in the frame. The bolt (#12) may be slid over off its screw (#40) toward the left side of the frame and lifted straight up out of the frame opening. Remove the trigger screw (#38) which is the forward-most screw in the right side of the frame, and the trigger (#10) may be lifted forward and out of the frame. The rear and lowest screw in the right side of the frame is the sear screw (#621) which may now be removed. The sear assembly (#618) may be lifted out of the frame opening.

Reassemble the revolver in the reverse order.

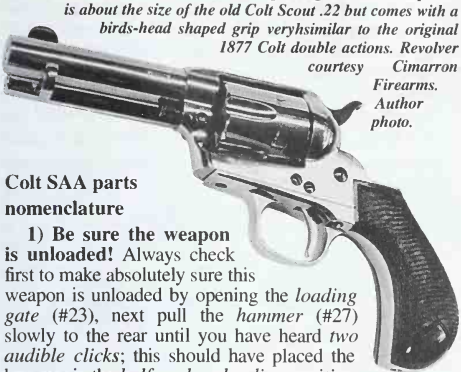
Cimarron Firearms Lightning Single Action

The idea for the .38 Special caliber Cimarron Lightning Single Action model, like its bigger brother 'Thunderer', came from Mike 'Texas Jack' Harvey, the president of Cimarron Firearms. This interesting new medium sized revolver is very similar in size to the 1877 Colt double action of which its grip shape and size are almost a perfect copy. In actual frame size, the Cimarron Lightning is very much like the older Colt Frontier Scout series of .22 single action revolvers. The new revolver is being made in Italy by Aldo Uberti, and Mike has had the factory modify both the angle of the grip and the hammer style slightly from the 1877 double action in order to offer a better handling gun for the shooter with medium to small hands. This six-shot revolver is now S. A. S. S. approved and is a chambered in .38 S&W Special caliber, so of course it will also safely fire .38 Colt cartridges.

One nice feature of the Lightning Single Action is that it makes use of a modern, spring loaded floating firing pin which is thoughtfully designed to be easily replaced. Cylinders in the Lightning model do not use a removable base pin bushing. A hammer blocking safety is not offered with this design, instead a double-notched base pin type safety device is used. To operate the safety, the hammer is placed at half-cock and the base pin catch depressed, the base pin may then be pushed into the frame farther than normal so that the base pin catch now engages the front notch on the base pin. This causes the base pin to protrude back into the hammer opening in the frame, interfering with hammer fall, thereby preventing the hammer from moving all the way forward. As far as repairs go, Cimarron's Lightning pistol is essentially just a scaled-down version of the Colt Single Action Army revolver with only a very few obvious alterations made on the original Colt plan and the reader should refer to the 1873 section for troubleshooting and repair information.

Cimarron Lightning type single action army revolvers

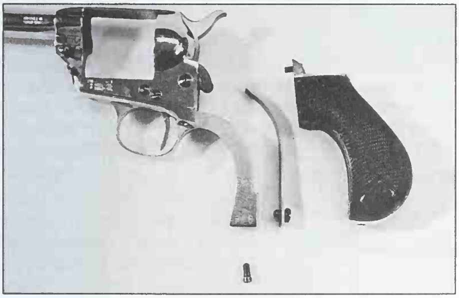
Takedown instructions



The Uberti-manufactured, Cimarron Lightning Model in .38 Special is about the size of the old Colt Scout .22 but comes with a birds-head shaped grip veryhsimilar to the original 1877 Colt double actions. Revolver courtesy Cimarron Firearms. Author photo.

Colt SAA parts nomenclature

1) Be sure the weapon is unloaded! Always check first to make absolutely sure this weapon is unloaded by opening the *loading gate* (#23), next pull the *hammer* (#27) slowly to the rear until you have heard *two audible clicks*; this should have placed the hammer in the *half-cock or loading position* and the *cylinder* (#12) should spin freely in a clock-wise direction. *Keep your fingers away from the trigger* during this entire operation! Slowly *rotate the cylinder two full revolutions* by hand, all the while examining the cylinder's chambers through the opening that has been presented by the opened *loading gate* at the rear of the frame (#20) to make absolutely certain that the cylinder chambers have no cartridges in them.



Cimarron's Lightning model one-piece grip is removed in exactly the same manner as you would with a Single Action Army, by unscrewing the back-strap and sliding the assembly off to the rear. This also exposes the mainstpring for removal. Revolver courtesy Cimarron Firearms. Author photo.

1a) What if cartridges are present?: *This is a loaded gun!* Leave the hammer right where it is: in the half-cock or loading position and with the loading gate opened. Using your left hand to hold the revolver securely by the grip, still keeping your *fingers away from that trigger*; tilt the revolver so that the barrel's muzzle (front) is facing away from you and upwards; in a direction that you determine is safe (so that if the gun did accidently fire no one would be injured.) Now, use your right hand to rotate that cylinder slowly, one chamber at a time; ***pausing at each audible click to allow each successive cartridge to fall out of its chamber*** and onto your workbench. If any cartridge will not fall out of its own weight; manually operate the ejector by pushing the *ejector rod head* (#13) located under the front of the barrel) to the rear with your right hand until the ejector rod has forced that cartridge out of the chamber. When you are absolutely certain that there are no more cartridges left in the cylinder chambers, the revolver may now be safely disassembled.

On short barreled versions it is necessary to remove the ejector tube to allow the base pin to be withdrawn far enough for cylinder removal. The base pin has two locking notches, when the base pin is pushed in so the base pin catch engages the forward notch this puts the revolver in the safety mode. Revolver courtesy Cimarron Firearms. Author photo.

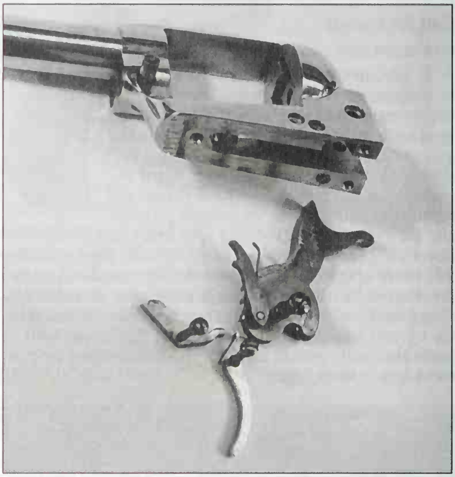
2) Cylinder removal: The hammer should still be resting in the loading or half-cocked position and the loading gate should still be open for this operation. The Single Action Army cylinder rotates on a part called the base pin (#7) which must first be removed through the front of the frame before the cylinder can be taken out. The base pin is held in place by a sliding, spring powered cross bolt. The base pin is removed by first depressing this cross bolt, which Colt calls the *base pin screw* (#8) and then pulling the base pin (#7) straight out the front of the frame (#12.) NOTE: On shorter barreled versions, you may have to remove the ejector tube assembly first since the base pin will be too long to be withdrawn far enough for cylinder removal unless the ejector assembly is removed (see step #5); Peripheral disassembly.) The cylinder (#14) may now be carefully slid out sideways from the right side of the frame. On these and most later model Uberti manufactured SAA revolvers you will note that the base pins have two notches behind the head. The rear notch is the one the base pin lock will engage when the gun is to be fired, the front notch is engaged when the shooter desires a safety and this pushes the base pin to the rear far enough

so that it interferes with the hammer, not allowing it to fall completely forward.

3) Grip and grip strap removal: 3a} If the revolver is equipped with **two-piece grips**; first remove the grip screw from the center of the grip and then remove the two grips, now proceed to step **3b**. In some cases these revolvers will be equipped with ***one-piece grips*** and are disassembled thus: **3b}** Remove the two *back-strap screws* (#2) from the top-rear of the *back-strap* (#1) and remove the single *butt-screw* (# 33) from the butt of the *back-strap*. The *back-strap* (#1) and the one piece *grip* (not shown) may be removed by pulling them down and to the rear as a unit. Once off the frame, the *grip* itself may be tilted forward and off the *back-strap*. Remove the *mainspring screw* (#33) from the inside-lower area of *trigger guard* (#54). The *mainspring* #32) will now lift out. Remove the two *trigger guard screws* (#34) and the *front trigger guard screw* (#21) and the *trigger guard* (#54) will remove from the bottom.

4) Action disassembly: Remove the *sear and bolt spring screw* (#47) [this is the only screw facing straight up] from the underside of the frame and the *sear and bolt spring* (#46) will fall out the bottom of the frame. Next, remove the *forward-most* of the three screws on the left side of the frame, this is the *bolt screw* (#11) which holds the *bolt* #10 in place, the bolt may now be removed from the bottom. Be sure to keep the *bolt screw* (#11) with the *bolt* (#10) while they are removed because the *trigger screw* (#55) may easily be mistaken for the *bolt screw* (#11) which is shorter. Now remove the *trigger screw* (#55) and the *trigger* (#53). The *hammer screw* (#30) may now be removed, after which the *hammer assembly* (#27) may be rotated slightly to the rear and pulled down and out of the frame. The *hand assembly* (#31) is connected to the *hammer* and will withdraw with it. Once the *hammer assembly* (#27) is out, the *hand assembly* (#31) may be removed by lifting it up out of its socket hole on the left side of the hammer.

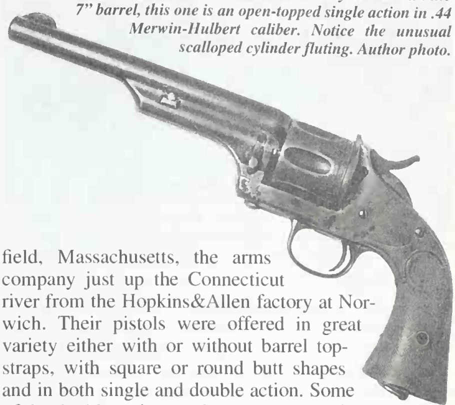
5) Peripheral disassembly: The ejector tube screw (#17) is removed from the front of the ejector tube (#16) and the entire ejector tube assembly may be pulled to the side by its front until it moves slightly away from the barrel, at this position the assembly may be withdrawn forward and off the barrel. The ejector rod (#14), rod head (#13) and its spring (#15) are removed by pulling them both straight back and out of the ejector tube except on early revolvers, with these you must unscrew the ejector rod (#14) from the ejector rod head (#13) and remove each part separately. Loading gate; under the frame in the right side frame rail you will notice a small screw, this is the gate catch screw (#25). Remove the screw (#25) and its plunger (#24) and spring (#26) out through the screw hole. The loading gate itself may now be removed by pulling it out toward the front of the frame.



The action components of the Cimarron Lightning are scaled down versions of the full sized SAA. Notice the flat hammer face, the Lightning is equipped with a floating firing pin. Revolver courtesy Cimarron Firearms. Author photo.

Reassemble the revolver in the reverse order.

Merwin-Hulbert Revolvers



An early production Merwin-Hulbert Army Model with the 7" barrel, this one is an open-topped single action in .44 Merwin-Hulbert caliber. Notice the unusual scalloped cylinder fluting. Author photo.

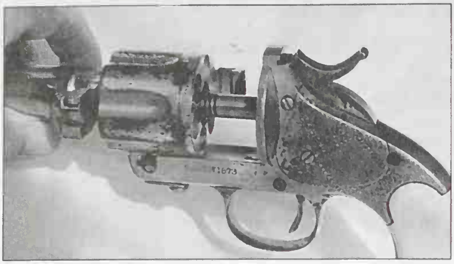
A brief history. The Merwin-Hulbert company was not an arms maker, rather they were a large firearms dealer-distributor who listed their address as New York City and were the successors of Merwin&Bray of Worcester, MA[1]. Merwin-Hulbert were according to Ned Schwing[2] the primary sales agents for Hopkins & Allen, and all their revolvers were actually manufactured by the Hopkins&Allen company in Norwich, CT, and they were made with what many people would think of as a surprisingly high degree of quality. From what I have learned over the years, quite a few of the engineers and top smiths working at the Hopkins&Allen plant during that period were actually some of the same boys who formerly worked for Smith & Wesson, Colt and Springfield armory. So maybe the M-H quality issue shouldn't be such a surprise after all?

Merwin-Hulbert marketed several variations of this unique twist-barrel revolver during the 1870s and 1880s. We were not able to ascertain the exact quantities of these guns produced since factory records were lost in a fire in the late 1880s[3], one source indicates that large quantities of the large framed "Army" revolvers were manufactured between 1876 to as late as 1885[4]. Another source[5] gives 1887 or possible even later as the date of M-Hs last production revolvers. Mike Venturino[6] speculates that between 10,000 and 20,000 large framed revolver were manufactured.

These truly unusual, yet functionally ingenious revolvers featured selective-simultaneous-ejection. What that meant is that when the gun was unlatched; the barrel was twisted ninety degrees to the right and pulled forward, the cylinder moved along with it but the cartridges (which were held in place by a steel ring on the breech frame that engaged the cartridge rims) stayed put. Once the cylinder had moved all the way forward, upon reaching the extent of its travel any empty-fired cartridge cases would fall away, but by virtue of their extra length any loaded cartridges (because they still had their bullets) would remain supported by the cylinder and would not fall away. These revolvers were loaded with the barrel latched in place, one cartridge at a time like the Colt Single Action Army, but via a sliding loading gate located at the right side of the frame's recoil shield. Merwin-Hulbert's twist barrel pistols were manufactured in three distinct frame sizes in .32, .38 and .44 calibers, very much mimicking the frame size and caliber offerings of Smith & Wesson at Springfield, Massachusetts, the arms company just up the Connecticut river from the Hopkins&Allen factory at Norwich. Their pistols were offered in great variety either with or without barrel top-straps, with square or round butt shapes and in both single and double action. Some of the double action models even came with an ingenious folding hammer spur. At one time M-H also offered a nearly exact copy of the Model One-Third Issue Smith & Wesson .22 tip-up revolver.

The .44 caliber M-H's that modern shooters are the most interested in were made from about 1876 up into the 1880s. These large framed revolvers were chambered in both 44-40 Winchester and the .44 Merwin-Hulbert (a cartridge similar to the .44 S&W American[7]) calibers and were known as the "Army" or "Frontier" (the name Frontier may not be historically correct but M-H collectors seem to use it to discriminate between "Army" model in .44 M-H caliber and so called "Frontier" models in 44-40 caliber) models. Army models were offered in the 7" barrel length (and later with a 5" barrel) without top-straps, in single and double action and with rounded or square butt shapes. There was also a shorter barreled (3-5/16") version of the same revolver that they called the "Pocket Army" which was offered only with the rounded "birds head" butt shape. One interesting feature of the "Pocket Army" is that the grips were made shorter than the length of the butt, leaving a fairly substantial steel "tail" hanging down. I've always thought these looked like they were intended to be used as a club that you could hit someone over the head with, but without taking the chance of breaking the grips in the process. In fact the name "skullcrusher" is often applied to these Pocket Army grip shapes.

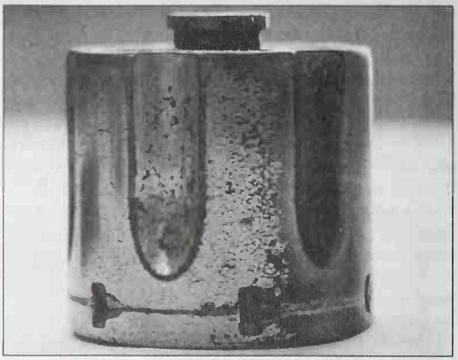
History by Dave...



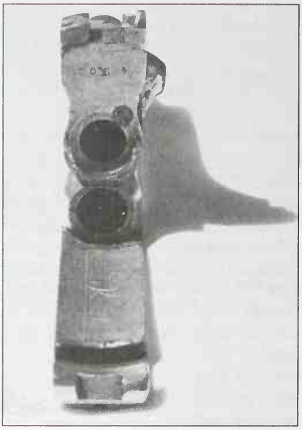
This is what the Merwin-Hulbert Army single action in .44 Winchester looks like with the barrel opened. The gun shown here is a later model with normal cylinder fluting and a barrel top-strap. Author photo.

Opening a Merwin-Hulbert. To open a Merwin-Hulbert twist barrel: The hammer is pulled back to the half-cock notch. Then the barrel latch, located in front of the trigger guard is operated by pushing it backwards with thumb pressure and the barrel is twisted to the right (clockwise viewed from the rear) until it stops, or about 90 degrees, at that point the barrel is pulled straight forward. As the barrel moves forward it pulls the cylinder with it but the cartridges, retained by their rims on the breech ring, stay where they are with the frame. Now as the barrel and cylinder reach the forward-most extent, their travel is limited by a machined cam surface on the base pin engaging a spring loaded lug within the barrel. If the cartridges have been fired they are now unsupported at their mouths and so they will fall away into the fully open breech area thence unto the ground. Any unfired cartridges will still be supported by their bullets laying in the rear of the cylinder chambers and by their rims on the breech ring, so these will remain in the gun.

Suction? You will notice that most Merwin-Hulbert revolvers were manufactured with a fairly large barrel under-lug area that is very similar in appearance to the Smith & Wesson American, although it was used for an entirely different purpose. This enlarged under-lug area is hollow and it contains a precisely drilled and reamed hole that is made to accept the frame arbor. This arbor hole actually serves much the same function as the barrel arbor hole we find on open-topped Colt percussion revolvers, only more so. Since this arbor hole is a blind hole, that is usually closely fitted to the arbor, a suction will be experienced while the barrel is being drawn forward or pushed back along the arbor because a vacuum or a pressure is being created. The tighter the fit of the arbor to the arbor hole in the barrel, compounded by the more grease or oil there is present in the arbor hole, the greater will be the felt resistence or "suction" as the barrel is slid back and forth on the arbor. On the few guns you may encounter that were made without this oversized barrel under-lug (these will normally be smaller .32 and .38 calibers) there will be no suction because of course; the barrel's arbor hole is open on both ends. Whether or not a Merwin has "suction" does not a good gun make, although a large frame M-H that had little or none would be immediately suspected of having heavy wear in the critical arbor/barrel area.



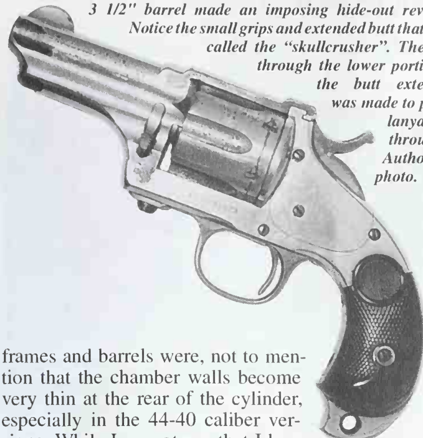
This view of the M-H .44 caliber cylinder clearly shows the lip at the front of the cylinder which locks into a mortice cut in the barrel forging, making an extremely effective gas ring seal. Author photo.

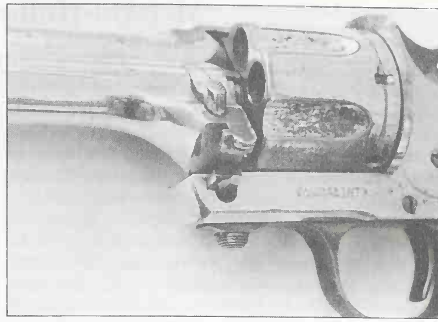


The back-side of an M-H barrel forging viewed from below. The top hole is the bore while the lower is where the arbor fits. Notice the mortice cut at the arbor hole where the cylinder lip fits. (See also previous photo.) Author photo.

Smokeless powder. . .no! Just above we described how these revolvers were manufactured during the 1870s and 1880s. That was a while before the invention of smokeless powder ammunition and the dates should be your first clue as to whether smokeless ammo is safe to shoot or not. Any Merwin-Hulbert revolver, repeat. . .any Merwin-Hulbert revolver should only be fired with ammunition that uses black powder or a black powder substitute as its propellant. We have to keep in mind that their beautifully machined and unique jointed frames and barrels are made from steel that is at the best, quite crude by modern standards. These frames and barrels are very soft; they can be (and are) easily stretched by firing modern smokeless ammunition. Likewise their cylinders are made from the same grade of steel as the

The M-H Pocket Army single action in 44/40 with a 3 1/2" barrel made an imposing hide-out revolver. Notice the small grips and extended butt that some called the "skullcrusher". The hole through the lower portion of the butt extension was made to pass a lanyard through. Author photo.





A Pocket Army with the barrel partially twisted open. Just look at the beautiful and intricate machine work Hopkins&Allen did here. Author photo.

frames and barrels were, not to mention that the chamber walls become very thin at the rear of the cylinder, especially in the 44-40 caliber versions. While I cannot say that I have personally seen many M-H's with blown or exploded cylinders, I truly have seen quite a few with bulged cylinders and with frame and barrel joints stretched so badly that any hope of restoring the original geometry was gone for good. We are not thinking here of those few guns that may have been fired with overly strong hand-loaded ammunition, I am speaking of the more commonly found damages done to M-H pistols that were fired by their owners in good faith (not knowing any better), and using factory smokeless powder ammunition that they believed was safe.

Parts and springs: Replacement parts for Merwin-Hulbert revolvers simply don't exist. Yes, if you try hard enough and look long enough you might uncover a handful of used parts at the gun shows. The truth is that in years of trying, we never managed to find any M-H parts in quantity so its best to assume that anything you need in the way of parts will have to be made from scratch, or you will have to try and repair the existing part. The operation of the hammer and trigger actions of M-H single action models are extremely similar to those in Smith & Wesson's single actions during the same time period, indeed if you will examine the two revolvers apart the similarities will become instantly apparent. Both guns use trigger actuated cylinder stops, both use a flat handspring bearing against a machine-ground cam on the hand's shank as well as a single stage hand, and both guns use hammers with only two notches; a half-cock and a full cock. Smith & Wesson and Merwin-Hulbert parts are not interchangeable by any means, but one can surmise a good bit by examining the operation of the one, so that the other might be repaired.

Loose barrels. Revolvers that have loose barrel-to-frame lock up may have a problem that can sometimes be traced to a weak or altered barrel latch spring (see parts list, #7), which no longer has the power to push the barrel latch fully forward. This would be easy to prove out by simply holding the barrel latch forward with thumb pressure and trying the barrel again to see if the looseness is gone. If the gun seems substantially tighter, then you have found the culprit and that condition can often be improved by just replacing the coil spring that powers the barrel latch with a slightly stronger (or longer) coil spring. However, if the revolver is still very loose, even while the barrel latch is being held forward under thumb pressure, then you are dealing with a gun that has worn frame/barrel joints and a gun with this kind of wear will require considerably more than a new spring to correct. Heavy repairs like such as this would be, are best left to the gunsmith who has years of experience with this sort of revolver already under his belt.

Another coil spring we find lacking in strength is the one used to return the cylinder stop on the double action models (this is the spring behind the tiny screw in the front trigger guard bow.) These delicate coil springs are usually found kinked and damaged, the victims of improper assembly procedure. The cylinder stop springs used in the single action Merwin-Hulberts (see parts list, #11) will be found broken fairly frequently and a suitable replacement for these springs can be made by taking the trouble to alter a similar spring that is still available; the cartridge stop spring from a Model 1892 Winchester rifle, and this will this usually will involve only the shortening of the leaf end of the spring.

1. *Flayderman's Guide to Antique American Firearms,* 7th Edition, Krause Publications
2. *Standard Catalog of Firearms*, 10th Edition Krause Publications
3. *Shooting Sixguns of the Old West*, by Mike Venturino
4. *Standard Catalog of Firearms*, 10th Edition Krause Publications
5. *The Story of Merwin & Hulbert & Company Firearms* by Art Phelps
6. *Shooting Sixguns of the Old West,* by Mike Venturino
7. *The Story of Merwin & Hulbert & Company Firearms* by Art Phelps

Merwin-Hulbert Single Action

Disassembly Instructions

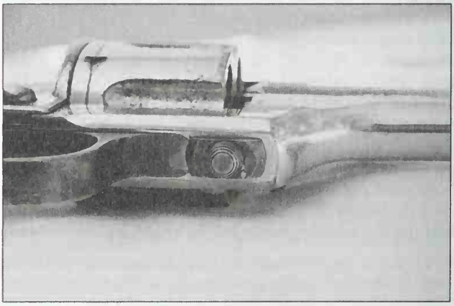
1) Check to be certain the Cylinder is unloaded; by first pointing the Barrel (#5) muzzle in a safe direction, then pull the Hammer (#16) back so that it rests in the half-cock notch (this is the first audible click encountered as the Hammer is drawn rearward from the fully forward position.) Slide the Loading Gate (#21) down to expose the chambers at the rear of the Cylinder and rotate the Cylinder (#8) one full turn while visibly examining each chamber, making certain that each chamber is empty.

Check to see if the chambers are empty by placing the hammer at half-cock than open the loading gate and rotate the cylinder. Author photo.

Here is the same Merwin-Hulbert with the barrel/cylinder opened for unloading. Author photo.

A loading gate in the closed position. The small ball shaped piece is what you push down on to open the gate. Author photo.

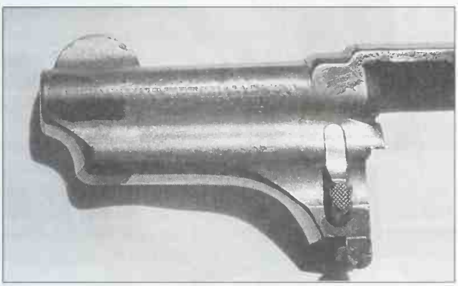
2) Open the weapon, then remove the Barrel and Cylinder: With the Hammer (#16) remaining in the half-cock position, you may open the Barrel (#5) by pushing the Barrel Latch (#6: located just forward of the Trigger Guard #33) toward the rear, while at the same time twisting the revolver Barrel to the right (clockwise when viewed from the rear) until it has turned about 90 degrees, then pull the Barrel so it will slide forward on the frame Arbor (#1) until it is fully extended. To fully remove the Barrel and Cylinder; grasp the Barrel (#5) and Cylinder (#9) as an assembly, now depress the Arbor Lock (#2) located on the left side of the barrel and pull the Barrel along with the Cylinder forward and off the Arbor (#1). The Cylinder may now be pulled straight down out of its seat with the Barrel.



Looking up from underneath the Pocket Army .44. The devise shown in the center of the photo is the barrel latch on a Pocket Army. It is operated by pushing it to the rear (left of photo). Author photo.

The Pocket Army 44/40 shown with the barrel opened. Author photo.

2a) Arbor Lock removal: The Arbor Lock (#2) may be removed by removing the Arbor Lock Screw (#3), this is located on the rear face of the barrel flat, just below the hole for the Arbor. Once the Arbor Lock Screw is out, the Arbor Lock (#2) and Arbor Lock Spring (#4) may be lifted out of their opening in the Barrel's side.



A well worn Pocket Army barrel, showing the manufacturer's markings. The knurled catch at the lower right of the barrel is the arbor latch which must be depressed in order to remove the barrel from the arbor. Author photo.

This is the top view of an M-H arbor clearly showing the machined cam slot in which the arbor latch rides. Author photo.

3) Grips, sideplate and mainspring removal: Place the Hammer (#16) in the fully down position. Remove the Grip Screw (#15) and remove the Grips (#14: Stocks). Remove the (3) Sideplate Screws (#s 27 and 28 ~2). Turn the Frame (#13) on its side holding it by the Arbor (#1), with the Sideplate (#26) facing up over a well padded bench-top surface. Strike the grip frame a sharp blow or two using a plastic or hardwood mallet, this shock will cause the Sideplate (#26) to jump up out of its seat in the frame for removal. NEVER attempt to pry off the Sideplate. Using a pair of "spreader" pliers, pry down on the top-rear of the Mainspring (#25) and disengage its "ears" from the Hammer's Stirrup (#29). Loosen the Mainspring Strain Screw (#31) and the Mainspring (#25) may be removed through the side of the grip frame.

4) Hammer removal: Using your off-hand, pull the Trigger (#32) to the rear and hold it there. With the tip of a small screwdriver, rotate the Hand (#18) to the rear and hold it there while you draw the Hammer (#16) about half way to the rear and lift it straight up off the Hammer Pivot Stud (#17) and out of the Frame (#13) through the Sideplate opening.

5) Trigger Guard and Cylinder Stop Spring removal: Remove the Trigger Guard Screw (#34) from the rear of the Trigger Guard (#33), this allows the Guard to pivot down at the rear. Pull the Guard down and to the rear until its front has disengaged from the Frame. The Barrel Latch (#6) and Barrel Latch Spring (#7) may now be removed out through the bottom of the Frame. Remove the Cylinder Stop Spring Screw (#12) and the Cylinder Stop Spring (#11) from the inside of the Guard.

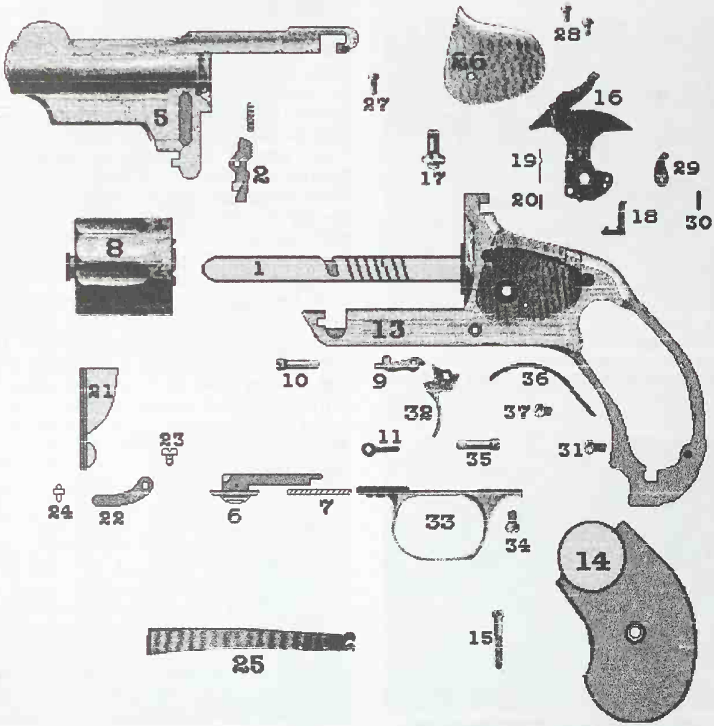
6) Trigger and Cylinder Stop disassembly: Remove the Cylinder Stop Screw (#10) from the left side of the Frame and withdraw the Cylinder Stop (#9) out through the bottom of the Frame. The Trigger Screw (#35) may now be removed from the right side of the Frame and the Trigger (#32) can be withdrawn out through the Frame bottom.

7) Loading gate and Trigger Spring removal: Remove the Loading Gate Spring Screw (#23) from inside the Sideplate opening and lift out the Loading Gate Spring (#22) and Loading Gate Spring Plunger (#24). The Loading Gate (#21) may now be pulled straight down and out of its mortice cut in the Frame. The Trigger Spring (#36) is retained by a small screw passing through the front grip strap just behind the Trigger Guard opening. Remove this Trigger Spring Screw (#37) and the Trigger Spring (#36) will lift out of the frame.

8) Hammer disassembly: Rotate the Hand (#18) 180 degrees and lift it out of its hole in the Hammer (#16). Note: the cut on the right side of the Hand's shank, during reassembly this is used to engage the Handspring (#19) so that the Hand may be installed without the aid of tools. Drift out the Handspring Pin (#20) which passes through the front of the Hammer (#16) from side to side, and the Handspring (#19) may be lifted out of its mortice cut at the front of the Hammer. Drift out the Stirrup Pin (#30) which passes through the rear of the Hammer from side to side, and the Stirrup (#29) may now be removed. Make note of the position of the Stirrup for correct reassembly.

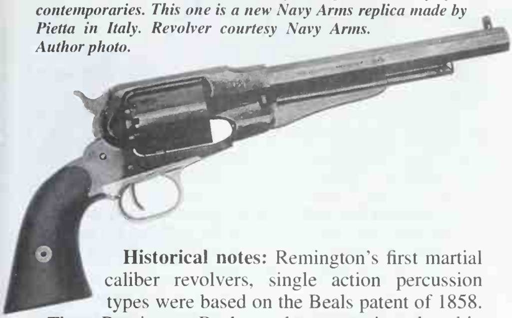
Merwin Hulbert Single Action Parts List

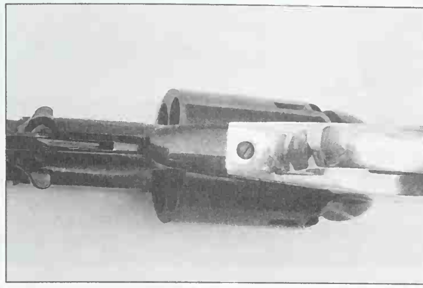
1. Arbor
2. Arbor Lock
3. Arbor Lock Screw
4. Arbor Lock Spring
5. Barrel
6. Barrel Latch
7. Barrel Latch Spring
8. Cylinder
9. Cylinder Stop
10. Cylinder Stop Screw
11. Cylinder Stop Spring
12. Cylinder Stop Spring Screw
13. Frame (receiver)
14. Grips
15. Grip Screw
16. Hammer
17. Hammer Pivot Stud
18. Hand
19. Handspring
20. Handspring Pin
21. Loading Gate
22. Loading Gate Spring
23. Loading Gate Spring Screw
24. Loading Gate Spring Plunger
25. Mainspring
26. Sideplate
27. Sideplate Screw, center
28. Sideplate Screw, front-rear
29. Stirrup
30. Stirrup Pin
31. Strain Screw
32. Trigger
33. Trigger Guard
34. Trigger Guard Screw
35. Trigger Screw
36. Trigger Spring
37. Trigger Spring Screw



Remington large caliber revolvers

Remington's percussion revolvers were made at the Ilion, N.Y. plant and were some of the best cap-n-ball pistols ever produced, with their solid frames they were certainly stronger than many of their contemporaries. This one is a new Navy Arms replica made by Pietta in Italy. Revolver courtesy Navy Arms. Author photo.

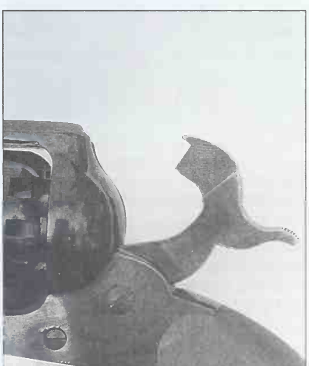




All Remington's large single actions used only one screw to fasten the brass trigger guard to the frame. Author photo.

Historical notes: Remington's first martial caliber revolvers, single action percussion types were based on the Beals patent of 1858. These Remington-Beals revolvers were introduced in 1860, in plenty of time to participate fully in the American Civil War first as the .36 caliber Navy model and quickly thereafter offered in an Army Model in .44 caliber. The Union army purchased many, many thousands of Remington's revolvers. The largest quantities of the various large framed Remington percussion single action revolvers being the New Model Army .44 caliber, of which approximately 132,000 were manufactured between 1863 and 1873[1].

Unlike the more familiar open-topped Colt revolvers, Remington's revolvers used a frame with a top-strap into which their barrels were permanently screwed. This new frame layout proved to be more rugged than the Colt, and also offered the shooter a fixed rear sight that was machined into the lock frame in place of the "V" notch on the front of the Colt hammer.



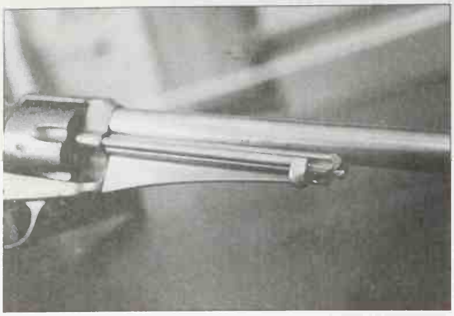
Notice the large flat firing pin on the front face of the hammer which is meant to smash the percussion cap flat. Author photo.

Competing with Colt

Historical notes
Replica Remingtons

An original Model 1875 Remington in .45 caliber showing the unusual "webbed" extractor housing. Author photo.

The Model 1875 Remington is outwardly similar to the Colt Peacemaker with one glaring exception, that distinctive "web" section formed under the length of the barrel by the ejector housing. We have wondered if this wasn't some attempt by Remington to keep the same basic outline as the previous, and very popular percussion models. It is this ejector housing that lends an air of extra strength to the Remington, even though any actual reinforcement is negligible. The Remington also loads and unloads just like its Colt counterpart; the hammer is placed in the half-cock position and cartridges are inserted into the cylinder chambers through an open loading gate on the right frame side and the empties were ejected from each chamber by using the barrel mounted manual ejector rod. On the Remington, the ejector rod itself was exposed, unlike the Colt's whose rod was encased within the ejector tube.



A close-up look at the front of the 1875 Remington ejector housing. The base pin in this model extends from just forward of the front of the ejector housing to the back of the frame, its locking lug is barely visible at the front of the housing. This model has ejector spring mounted inside the housing, it slides around the outside of the base pin. Author photo.

Remington's last single action was the Model 1890, this was very much the same revolver as the 1875 but the ejector housing was made slimmer. This is a replica made by Aldo Uberti in 44-40 caliber. Author photo.

Another unique feature that the 1875 Remington had in common with its percussion forefathers, was that it didn't use a separate grip frame like the Colt instead the entire grip area was forged as one piece of steel along with the lock frame, thus eliminating several parts and greatly strengthening the grip area in the bargain. Its two-piece walnut grips were held with one grip screw. Remington's original 1890 revolver was the Model 1875 with this ejector tube "web" machined down to a bare minimum with basically no other changes except for the option of hard rubber grip panels. Just as with their percussion models, only the Trigger guard is removable on the Remington and it is held on with only one screw. A further simplification over the Colt was that the Single Action Army just like all previous Colt revolvers used a separate screw for the trigger and for the bolt while Remington, from its earliest cap-n-ball pistols, chose to use just one screw as the pivot for both parts.

Replica Remingtons. Several replica arms makers are producing copies of the Remington revolvers, especially of the New Model Army percussion, the 1875 and the 1890 cartridge revolvers and these are sold here under various trade names. Apparently the most popular of the Remington replicas has been the replica sold by Navy Arms of the New Model Army .44 percussion which is manufactured in Italy by Pietta. Navy Arms informs the author that as of 1997 they had sold over 200,000 of these, in this case actually exceeding the original Remington production of the parent revolver. Aldo Uberti also makes a quality copy of the New Model Army as well as of the two large-framed cartridge Remington revolvers. Just for the record, most of these replicas are marketed as the "1858 Remington New Model Army", 1858 is the date of the original Remington-Beals patent, but the New Model Army was introduced in 1863 and it is this latter model which seems to be the design most of the replica companies are copying.

1. *Standard Catalog of Firearms,* 10th edition, 2000, by Ned Schwing, Krause.

Remington and Remington type percussion revolvers of the 1858 New Army pattern.

Takedown instructions

Navy Arms-Pietta parts nomenclature is used within the text.

With only minor variations, the following instructions can be suitable for use with nearly all of the Remington percussion ignition type revolvers, and copies thereof based on this pattern.

1) Be absolutely sure the revolver is not loaded! Always place the hammer (#17) in the loading position and check to be certain that the revolver's cylinder (#3) is unloaded before attempting any disassembly or before handling the revolver. Perform this check by carefully examining the rear of the cylinder at *each chamber* to be certain that; A) there are no percussion caps on any of the nipples. If percussion caps are present on the nipples you should consider this a loaded firearm; *do not attempt any further disassembly*, and B) you should always look at the front of the cylinder to make sure that there are no charges in the cylinder chambers (a good indication that a chamber is most likely loaded would be if bullets or balls are showing at the front end of the chamber.) A loaded cylinder may be emptied by taking the gun to a range and firing it until it is empty or the cylinder may be carefully removed without firing the revolver in order to render the revolver itself safe for further operations by following the instructions at **2)** below.

By unlatching the loading lever, the base pin can be withdrawn for cylinder removal. When the level is up and locked it blocks the base pin from moving forward. Author photo.

2) Cylinder removal: Place the *hammer* (#17) in the loading position so that the cylinder will spin freely. Unlatch the *loading lever* (#4) by pulling the *loading lever latch* (#24) to the rear and allow the loading lever to drop so it is pointing at the floor. Pull forward on the *base pin* (#6) and withdraw the base pin as far as it will go. The *cylinder assembly* (#3) may now be removed from the frame by rolling it out the left side of the frame (#1.)

3) Cylinder disassembly: The only disassembly that will be required, or that is indeed possible on the *cylinder* (#3) would be the removal of the *percussion nipples* (#11) and this step should be accomplished with a special tool called a *nipple wrench* which is available from Navy Arms. Percussion nipples are screwed in and have right-hand threads, this means that they unscrew in a counter-clockwise direction. Original Remington and other vintage percussion revolvers may have nipples which have been hand fitted to each specific chamber and care should always be taken that these are re-installed in exactly the chamber they were removed from.

4) Grip, mainspring and guard removal: The revolver is equipped with two-piece grips, first remove the *grip screw* (#31) from the center of the left hand *grip* (#13) and then remove the two *grips* (#s 13 & 16.) Loosen the *mainspring screw* (#35), the bottom of the *mainspring* (#14) may be tapped sideways out of its slot in the grip frame in either direction by using a small hammer against a 1/8" pin punch. Remove the *trigger guard screw* (#34) from the front of the guard bow. The *trigger guard* (#7) may now be tilted down from the front and pulled forward and down, off the frame. (**Note:** to re-install the mainspring, hold its top up against the bottom of the *roller* (#21) at the lower-rear side of the hammer, grasp the spring by its bottom-side with a strong pair of pliers and push upwards, causing the spring to bend just far enough for you to re-seat it within its slot in the frame. Once you have the spring started into the slot, you can release your grip with the pliers and then use the small punch and hammer to re-seat the spring fully into the frame slot.)

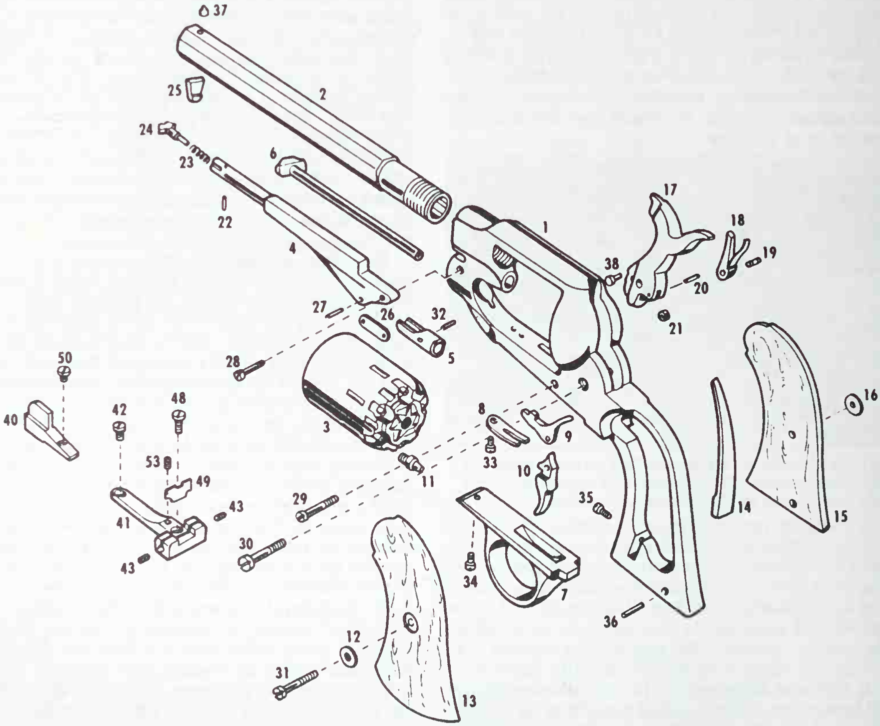
5) Action disassembly: Remove the *trigger bolt spring screw* (#33) [this is the only screw inside the action that is facing straight up] from the underside of the frame and the *trigger bolt spring* (#8) will fall out the bottom of the frame. Next, remove the forward-most of the two screws on the right side of the frame, this is also the smaller of the two and is called the *trigger screw* (#29) which holds the *bolt* (#9) and the *trigger* (#10) in place, *the trigger* (#10) *and the bolt* (#9) may now be removed from the bottom. The *hammer screw* (#30) may now be removed, after which the hammer assembly (#17) is pushed down far enough so that the *hand screw* (#38) becomes fully exposed. Remove the hand screw (#38) and push the *hammer* (#17) back up through the frame and remove it through the hammer opening at the frame top. The *hand assembly* (#18) may now be withdrawn out the bottom of the frame.

6) Peripheral disassembly: The *loading lever assembly* (#14) may be removed by removing the *loading lever screw* (#28) from the front-left side of the frame and pulling the *loading lever* assembly forward and out the front of the frame. Once the loading lever is out of the frame, the *base pin* (#6) may be fully withdrawn from the front.

Reassemble the revolver in the reverse order.

1858 Remington New Model parts

1. Frame
2. Barrel
3. Cylinder
4. Loading lever
5. Plunger
6. Cylinder pin
7. Trigger guard
8. Trigger & bolt spring
9. Bolt
10. Trigger
11. Nipple
12. Grip nut
13. Left grip
14. Mainspring
15. Right grip
16. Grip nut
17. Hammer
18. Hand
19. Hand screw
20. Roller pin
21. Roller
22. Latch pin
23. Latch spring
24. Loading lever latch
25. Barrel catch
26. Link
27. Link pin
28. Loading lever screw
29. Trigger & bolt screw
30. Hammer screw
31. Grip screw
32. Plunger pin
33. Trigger & bolt spring screw
34. Trigger guard screw
35. Mainspring screw
36. Grip pin
37. Sight



Remington and Remington type 1875 revolvers.

Takedown instructions

Uberti 1875 Outlaw parts nomenclature is used within the text.

With only minor variations, the following instructions can be suitable for use with nearly all of the Remington metallic cartridge single action type revolvers, and copies thereof based on this pattern.

1) Be sure the weapon is unloaded! Always check first to make absolutely sure this weapon is unloaded by opening the loading gate (#142), next pull the hammer (#2) slowly to the rear until you have heard *two audible clicks*; this should have placed the hammer in the half-cock *or* loading position and the *cylinder* (#5) should spin freely in a clock-wise direction. *Keep your fingers away from the trigger* during this entire operation! Slowly *rotate the cylinder two full revolutions* by hand, all the while examining the cylinder's chambers through the opening that has been presented by the opened *loading gate* at the rear of the frame (#1) to make absolutely certain that the cylinder chambers have no cartridges in them.

1a) What if cartridges are present?: ***This is a loaded gun!*** Leave the hammer right where it is: In the half-cock or loading position and with the loading gate opened. Using your left hand to hold the revolver securely by the grip, still keeping your *fingers away from that trigger*; tilt the revolver so that the barrel's muzzle (front) is facing away from you and upwards; in a direction that you determine is safe (so that if the gun did accidently fire no one would be injured.) Now, use your right hand to rotate that cylinder slowly, one chamber at a time; ***pausing at each audible click to allow each successive cartridge to fall out of its chamber*** and onto your workbench. If any cartridge will not fall out of its own weight; manually operate the ejector by pushing the *ejector rod head* (#164) (located under the front of the barrel) to the rear with your right hand until the ejector rod has forced that cartridge out of the chamber. When you are absolutely certain that there are no more cartridges left in the cylinder chambers, the revolver may now be safely disassembled.

2) Cylinder removal: with the *hammer* (#2) still in the loading position so that the *cylinder* (#5) will spin freely. Open the *loading gate* (#142). Push in on the *base pin screw* (#140) which is located on the left-front of the frame, just under the barrel. Withdraw the *base pin* (#21) to the front far enough so that the cylinder is free to be removed out the right side of the frame. The *cylinder assembly* (#5) may now be removed from the frame by rolling it out the right side of the frame (#1). (See 2a below for original Remington revolvers)

3) Grip, mainspring and guard removal: This revolver is equipped with two-piece grips, first remove the *grip screw* (#54) from the center of the left hand *grip* (#46) and then remove the two *grips* (#s 45 & 46.) Loosen the mainspring screw (#53), the bottom of the mainspring (#20) may be tapped sideways out of its slot in the grip frame in either direction by using a small hammer against a 1/8" pin punch. Remove the trigger guard screw (#31) from the front of the guard bow. The *trigger guard* (#26) may now be tilted down from the front and pulled forward and down, off the frame. (**Note:** to re-install the mainspring, hold its top up against the bottom of the hammer *roll* (#25) at the lower-rear side of the hammer, grasp the spring by its bottom-side with a strong pair of pliers and push upwards, causing the spring to bend just far enough for you to re-seat it within its slot in the frame. (Once you have the mainspring started into the slot, you can release your grip with the pliers and then use the small punch and hammer to re-seat the spring fully into the frame slot.)

4) Action disassembly: Remove the bolt spring screw (#35) [this is the only screw inside the action that is facing straight up] from the underside of the frame and the *sear & bolt spring* (#19) will fall out the bottom of the frame. Next, remove the forward-most of the two screws on the right side of the frame, this is also the smaller of the two and is called the trigger screw (#38) which holds the bolt #12 and the trigger #10 in place, the trigger #10 *and* the bolt #12 may now be removed from the bottom. The hammer screw (#37) may now be removed, after which the *hammer assembly* (#2) is pushed down far enough so that the *hand screw* (#52) becomes fully exposed. Remove the hand screw (#52) and push the hammer (#2) back up through the frame and remove it through the hammer opening at the frame top. The *hand assembly* (#s 7 & #18) may now be withdrawn out the bottom of the frame.

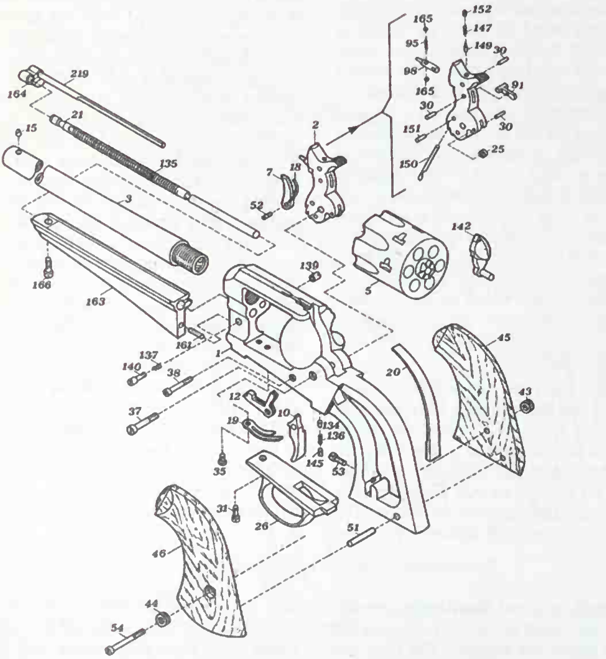
5) Peripheral disassembly: The support ejector (#163) may be removed by first removing the support ejector screw (#166) from the front-bottom of the barrel (#3) and pulling the support ejector down slightly and along with the *ejector* and *base pin* assemblies; forward and out the front of the frame. Once the support ejector is out of the frame, the *base pin* (#21) may be fully withdrawn from the front, and the *ejector assembly* (#219) along with the *ejector spring* (#135) may be withdrawn out the rear of the *support ejector.*

Reassemble the revolver in the reverse order.

2a) Cylinder removal, original Remington revolvers: Depress the base pin catch at the very front of the base pin, located just under the muzzle. The base pin may now be withdrawn far enough to remove the cylinder. The ejector housing screw may now be removed and the ejector housing pulled forward and down off the frame. The base pin, ejector and ejector spring will come off along with the ejector housing.

Parts for the Uberti 1875 Outlaw

1. Frame
2. Hammer
3. Barrel
5. Cylinder
7. Hand
10. Trigger
12. Bolt
15. Front sight
18. Hand spring
19. Sear & bolt spring
20. Main spring
21. Base pin
25. Hammer roll
26. Trigger guard
30. Hammer pin
31. Trigger guard screw
35. Bolt spring screw
37. Hammer screw
38. Trigger screw
43. Right grip nut
44. Left grip nut
45. Right grip
46. Left grip
51. Grip pin
52. Hand screw
53. Main spring screw
54. Grip screw
91. Hammer safety bar
95. Firing pin spring
98. Firing pin
134. Gate catch
135. Ejector spring
136. Gate spring
137. Base pin spring
139. Base pin nut
140. Base pin screw
142. Gate
145. Gate catch screw
147. Hammer safety spring
149. Hammer safety pin
150. Hammer safety plunger
151. Hammer safety plunger pin
152. Hammer safety stop screw
161. Support ejector pin
163. Support ejector
164. Ejector nut
165. Firing pin sphere
166. Support ejector screw
219. Ejector



Remington Double Derringer

Takedown instructions

Illustration from The Gun Digest Book of Exploded Firearms Drawings, 2nd edition, edited by Harold A. Murtz ©DBI Books Inc., 1977 Printed with permission of the publisher: Krause Publications, 700 E. State Street, Iola, WI 54990-0001 Phone 800 258-0929

1) Be sure that this weapon is unloaded! Grasp the pistol around the grips (#22) while pointing the muzzle in a safe direction and be careful to keep your fingers away from the trigger (#15) at all times. Rotate the barrel lock (#14) to unlock the barrels (#18) and tilt the barrels up, check the chambers at the rear of the barrels to be sure there are no cartridges in them.

2) Remove the barrel: With the barrels still in the open position, remove the barrel hinge screw (#21) and lift the barrels (#18) out of the frame (#1). The ejector (#19) may be removed by first unscrewing the ejector screw (#20), then the ejector may then be slid to the rear and out of its mortice in the barrel's side.

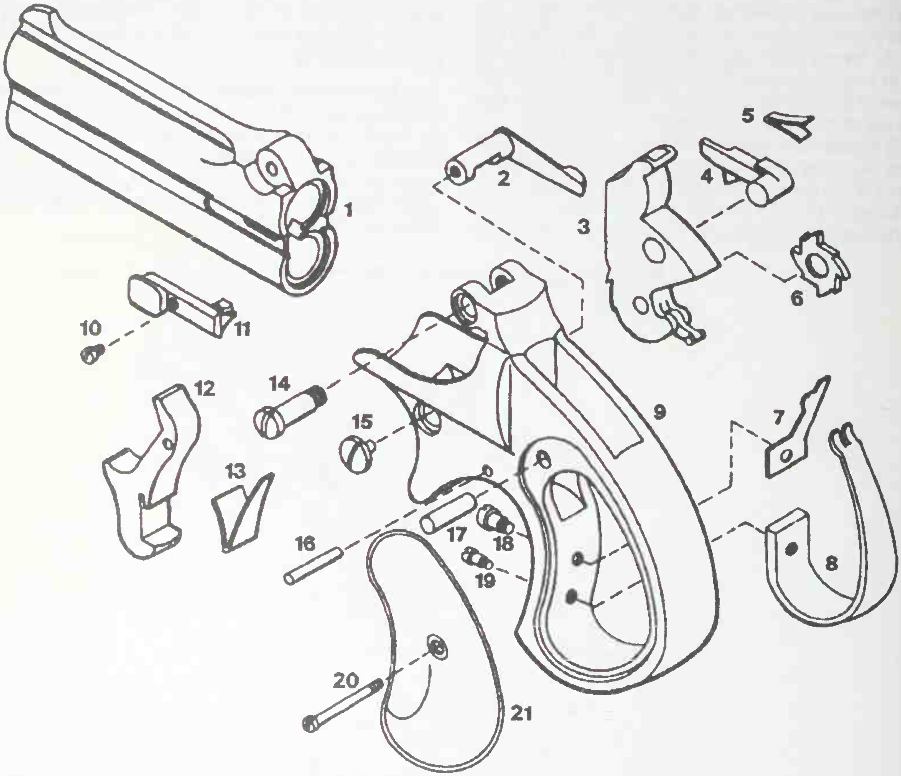
3) Frame disassembly: Remove the grip screw (#24) from the center of the grips and then remove both grip panels (#22.) Cock the hammer (#6) and pry the top of the mainspring (#4) forward with a small screwdriver blade while shaking or tapping the frame lightly on a wooden bench top to disengage the top of the mainspring from the ears of the hammer stirrup (#8.) Allow the hammer to fall forward gently after the mainspring is disengaged and then release the mainspring. Remove the mainspring screw (#2) the lower of the two screws) and the firing pin ratchet spring screw (#3) the upper of the two screws) from the bottom-front of the grip portion of the frame and then remove the mainspring (#4) and the firing pin ratchet spring (#5) from the frame. Drift out the hammer pin (#1) and the hammer (#6) may be pulled out through the top of the frame along with the firing pin ratchet (#10), firing pin (#11) and firing pin spring (#12) as an assembly. These three parts (#s 10, 11 & 12) may be removed from the hammer by pulling them free with your fingers. Note the position of each for reassembly later.

4) Lower frame disassembly: After unscrewing the barrel lock screw (#13) from the left side of the frame, the barrel lock (#14) may be pulled out of the frame from the right. Use a small pin punch to drift out the trigger pin (#16) and the trigger (#15) along with the trigger spring (#17) can be withdrawn out through the inside-top of the frame.

Reassemble the pistol in the reverse order of above.

Parts for Remington Double Derringer

1. Barrels
2. Barrel lock
3. Hammer
4. Firing pin
5. Firing pin spring
6. Firing pin ratchet
7. Firing pin ratchet spring
8. Mainspring
9. Frame
10. Ejector screw
11. Ejector
12. Trigger
13. Trigger spring
14. Barrel hinge screw
15. Barrel lock screw
16. Trigger pin
17. Hammer pin
18. Firing pin ratchet spring screw
19. Mainspring screw
20. Grip screw
21. Grips (2)



Ruger

Beginnings. William B. Ruger and Alexander Sturm began Sturm, Ruger & Company in 1949 with an ingenious little semi-automatic .22 pistol that became known as the "Standard" model. After the death of Sturm in 1951, Bill Ruger turned his attention to completing his ideas for the manufacture of a modern single action revolver. The first of these was introduced in 1953 as the .22 caliber, six shot "Single Six"[1] and was based on the appearance of the familiar Colt Peacemaker, albeit smaller and with a lock mechanism powered by music wire coil springs in place of the leaf springs used in Colts. This very innovative new revolver also used a grip frame that was cast from one piece of aluminum as well as a frame-mounted floating firing pin.

Flat-tops. Ruger expanded this concept in 1955 with the release of the full-sized .357 Magnum Blackhawk revolver, a .44 Magnum caliber Blackhawk followed on its heels in 1956. Both of these revolvers are known by collectors as the "Flat-top Blackhawk" because their top-straps were perfectly flat and were ever-so neatly morticed (machined) to accept the Micro adjustable rear sight and were manufactured until 1962-3. Many single action lovers (the author included) think of these early Blackhawks as the most beautiful and practical sixguns Ruger has ever built. The flat-tops were just about exactly the same size as a Colt Single Action Army, with whom they shared an identical grip angle, the .44 caliber version being especially well balanced. Only about 42,000 of the .357 caliber Blackhawk and about 28,000 .44 caliber were manufactured[2].

A Super and the 2nd generation of Blackhawk. Seeing the need for a more robust revolver to hold the powerful .44 Magnum cartridge, in 1959 a larger framed and stronger version of the Blackhawk, called the "Super Blackhawk" was released to the public. Not only was the frame larger and thicker but a new Ruger designed adjustable rear sight was added, and the receiver's top-strap around it was built up, providing more protection to the sight. After the .44 Magnum Blackhawk was dropped in 1963, the Super was the only .44 Magnum available from Ruger for years. Bill Ruger then took the strong points from the Super Blackhawk's design and scaled it down creating in 1962 a new family of Blackhawk's that eventually included calibers .30 U.S. Carbine, .357 Magnum, .41 Magnum and .45 Colt. Some of these redesigned Blackhawk revolvers were produced with interchangeable cylinders as convertible revolvers in .9mm/.357 Magnum and .45 Colt/.45 ACP calibers. For only a short while in 1963 and 1964 Ruger produced a single shot pistol called the "Hawkeye" based on the Blackhawk, which chambered the .256 Winchester Magnum cartridge. In place of a revolver cylinder the Hawkeye used a breech block which cammed out to the side for loading.

New Models; the safe single action revolver. Probably in an attempt to eliminate any potential for frivolous lawsuits that might grow out of the basic action design which was as old as the Colt Paterson revolver, in 1973 William B. Ruger completely replace his entire line of single action revolvers with a radical new design. What he did in one felled swoop did not win any popularity contests between Ruger and the single action "purists," however he did produce the safest single action revolver that the world has ever seen. These "New Models" as they are universally called, were equipped with a new transfer bar to remove the possibility of an accidental discharge should the revolver ever be dropped on its hammer. Gone was the old "three clicks" of the hammer, in fact the hammer is not even touched during the loading or the unloading process. The New Models are loaded by simply opening the loading gate which depresses the bolt, thus allowing the cylinder to rotate freely for loading and unloading. When the hammer is down it is unable to reach the firing pin. The hammer may only make contact with the firing pin when the trigger has been pulled to the rear, the action of which pushes the transfer bar up so it is in between the hammer and the firing pin where it will transfer the hammer's blow to the firing pin. A kit is available for owners of "old model" (three-clicker) Ruger single action revolvers who desire greater safety which replaces the old internal parts with re-designed ones that use a transfer bar ignition similar to the ones used on "New Model Blackhawk."

It is not be within the scope of this book to deal with every one of the ever-so-many Ruger single action models, that would take a book in itself. Instead we will confine this to the Old-Models, the three clickers which also encompasses the flat-top Blackhawk.

Ruger's Single Action

1. *Standard Catalog of Firearms,* 10^{th} Edition by Ned Schwing, 2000, Krause.
2. *A Blacksmith Guide to Ruger Flattops and Super Blackhawks,* by H.W. Roos, Jr., 1982 Blacksmith.

Old style Ruger Blackhawk and Super Blackhawk Revolvers

Takedown instructions

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1) Always be sure the weapon is unloaded! Check first to make absolutely sure this weapon is unloaded by opening the *loading gate* (#48), next pull the *hammer* (#21) slowly to the rear until you have heard *two audible clicks*; this should have placed the hammer in the *half-cock* or *loading position* and the *cylinder* (#46) should spin freely in a clockwise direction. *Keep your fingers away from the trigger* during this entire operation! Slowly *rotate the cylinder* (#46) *two full revolutions* by hand, all the while examining the cylinder's chambers through the opening that has been presented by the opened *loading gate* at the rear of the frame (#1) to make absolutely certain that the cylinder chambers have no cartridges in them.

1a) What if cartridges are present?: ***This is a loaded gun!*** Leave the hammer right where it is: In the half-cock or loading position and with the loading gate opened. Using your left hand to hold the revolver securely by the grip, still keeping your *fingers away from the trigger*; tilt the revolver so that the barrel's muzzle (front) is facing away from you and upwards; in a direction that you determine is safe (so that if the gun did accidently fire no one would be injured.) Now, use your right hand to rotate that cylinder slowly, one chamber at a time; ***pausing at each audible click to allow each successive cartridge to fall out of its chamber*** and onto your workbench. If any cartridge will not fall out of its own weight; manually operate the ejector by pushing the *ejector rod head* (#19) located under the front of the barrel) to the rear with your right hand until the ejector rod has forced that cartridge out of the chamber. When you are absolutely certain that there are no more cartridges left in the cylinder chambers, the revolver may now be safely disassembled.

2) Cylinder removal: The hammer should still be resting in the loading or half-cocked position and the loading gate should still be open for this operation. The Ruger single action Blackhawk cylinder rotates on a part called the base pin (#47) which must first be removed through the front of the frame before the cylinder can be taken out. The base pin is removed by first depressing this cross bolt, which Ruger calls the *base pin latch* (#9) from left to right and then pulling the base pin (#47) straight out the front of the frame (#1.) The cylinder (#46) may now be carefully slid out sideways from the right side of the frame

3) Grip and grip strap removal: Remove the grip screw (#50) from the center of the grip and then remove the two grips (#49.) Bring the hammer (#21) to the cocked position and slip a small steel pin or nail through the exposed hole at the bottom of the hammer strut (#29), this will confine the mainspring when the hammer is released from full cock. Now pull the trigger and gently release the hammer. Remove the five screws (#s 40, 41 & 42) that hold the grip frame (#39) onto the cylinder frame. As the grip frame is separated from the frame, note the pawl spring (#27) and plunger (#28) which are sandwiched between the rear of the frame and the top of the grip frame. The grip frame may be removed by pulling it slightly to the rear and then down, using care to hold the pawl spring and plunger captive. The mainspring/strut assembly (#s 29, 30 & 31) may be removed from the side of the grip frame and the trigger spring with its plunger (#s 43 & 44) may be withdrawn out of their hole at the inside rear of the trigger guard.

4) Action disassembly: The hammer screw (#25~ the rear-most screw in the side of the frame) may now be removed, after which the hammer assembly (#21) may be rotated slightly to the rear and pulled down and out of the frame. The pawl (#26) is connected to the hammer and will withdraw with it. Once the hammer assembly (#21) is out, the pawl (#26) may be removed by lifting it up out of its socket hole on the left side of the hammer. Remove the trigger screw (#38~ the center screw in the side of the frame) and the trigger (#35) will fall out the bottom of the frame. Use a small pick or screwdriver blade and carefully lift the fixed arm of the cylinder latch spring (#37) to free it, removing its tension from the cylinder latch (#36.) Remove the cylinder latch screw (#3~ the forward-most screw in the side of the frame) and the cylinder latch (#36) along with its spring (#37) may be taken out the bottom of the frame. Make note of the positioning of the spring for reassembly.

4a) Hammer disassembly: The hammer plunger (#22) and plunger spring (#23) can if required be disassembled from the hammer by drifting out the hammer plunger retaining pin (#24).

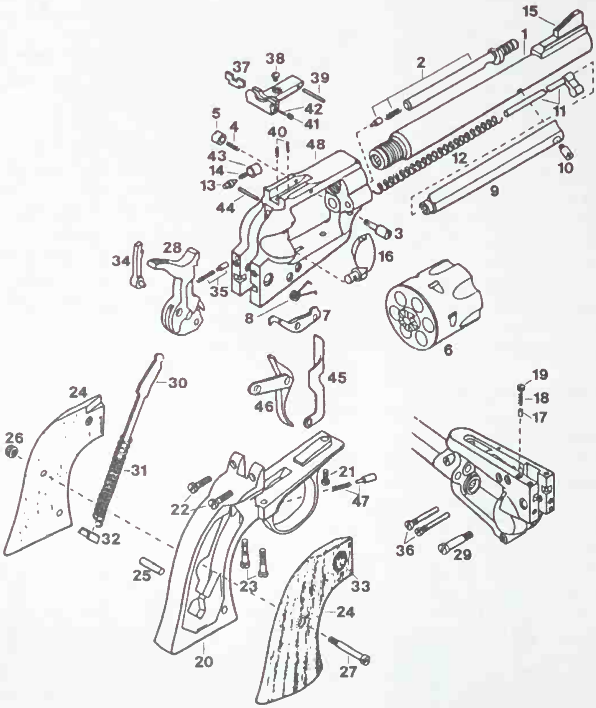
5) Peripheral disassembly: The ejector housing screw (#18) is removed from the front of the ejector housing (#17) and the entire ejector housing assembly may be pulled to the side by its front until it moves slightly away from the barrel, at this position the assembly may be withdrawn forward and off the barrel. The ejector rod (#19) and its spring (#20) are removed by pulling them both straight back and out of the ejector housing. Gate (#48); under the frame in the right side frame rail you will notice a small screw that faces up, this is the gate spring screw (#34). Remove that screw

(#34) and its plunger (#32) and spring (#33) out through the screw hole. The gate (#48) itself may now be removed by pulling it out toward the front of the frame. The adjustable rear sight (#2) may be removed by first unscrewing the rear sight elevation screw (#4) and then drifting out the rear sight pivot pin (#3), once the sight is free use caution: there are two tiny compressed coil springs (rear sight elevation springs #5) located directly under the rear sight. The rear sight leaf (#6) may be removed by removing the rear sight leaf windage screw (#7) and the rear sight leaf spring (#8) the sight leaf to one side and tilting it up so it can be pulled out the top.

Reassemble the revolver in the reverse order.

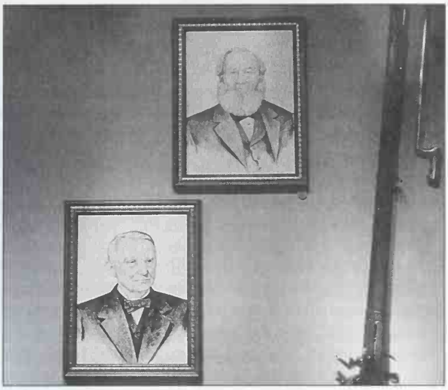
Parts for Ruger Blackhawk and Super Blackhawk, old models

1) Barrel
2) Base Pin Assembly
3) Base Pin Latch
4) Base Pin Latch Spring
5) Base Pin Nut
6) Cylinder
7) Cylinder Latch
8) Cylinder Latch Spring
9) Ejector Housing
10) Ejector Housing Screw
11) Ejector Rod Assembly
12) Ejector Spring
13) Firing Pin
14) Firing Pin Rebound Spring
15) Front Sight
16) Gate Assembly
17) Gate Detent Plunger
18) Gate Detent Spring
19) Gate Spring Screw
20) Grip Frame
21) Grip Frame Screws, Front
22) Grip Frame Screws, Back
23) Grip Frame Screws, Bottom
24) Grip Panels
25) Grip Panel Dowel
26) Grip Panel Ferrule, left
27) Grip Panel screw
28) Hammer
29) Hammer pivot
30) Hammer Strut
31) Mainspring
32) Mainspring Seat
33) Medallion
34) Pawl
35) Pawl Spring and Plunger
36) Pivot Screws
37) Rear Sight Blade
38) Rear Sight Elevation Screw
39) Rear Sight Pivot Pin
40) Rear Sight Springs
41) Rear Sight Windage Adjusting Screw
42) Rear Sight Windage Spring
43) Recoil Plate
44) Recoil Plate Cross Pin
45) Transfer Bar
46) Trigger
47) Trigger Spring and Plunger
48) Frame.

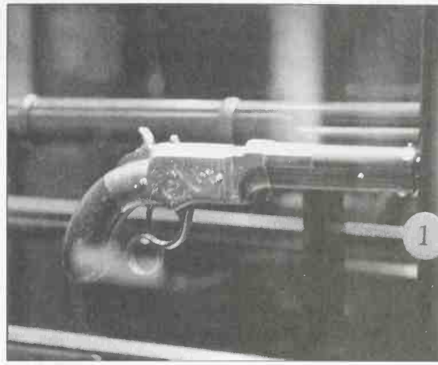


Smith & Wesson's Revolvers

Smith & Wesson's Unique Revolvers



These likenesses of Daniel B. Wesson (top) and Horace Smith (bottom) are part of a display at the National Firearms Museum. Bullet 'N Press photo.



This S&W Volcanic lever action pistol on display at the National Firearms Museum in Fairfax, VA, is the predecessor to the famous Henry and Winchester rifles. Bullet 'N Press photo.

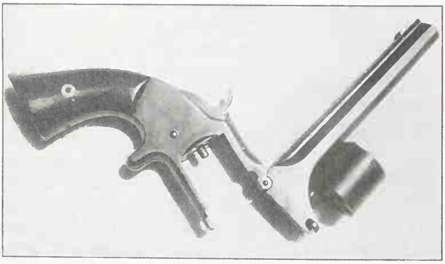
Beginnings: Smith & Wesson's contributions to the "guns of the old west" began earlier in time and were far more substantial than many people realize. Both Horace Smith and Daniel Baird Wesson had been well known in the arms making industry in and around the Connecticut River Valley for years before this, but they first appeared as the Smith & Wesson partnership in about 1852 to produce a very radical firearm; the Magazine Pistol, which has also been known as the Volcanic. S&W's Magazine Pistol was a lever action, tubular magazine fed, repeating pistol that in the 1850s actually fired case-less ammunition! Unable to make this venture into a financial success, the partners sold the Volcanic designs, patents and machinery to the prominent New Haven businessman O. F. Winchester in 1855. Winchester promptly hired an old associate of Smith & Wesson, B. Tyler Henry and put him to work on the project. Henry had previously played a role with Smith and Wesson during the original design work, then later while the Magazine Pistol was in production. A talented gunsmith and engineer, by 1860 Henry had managed to transform the basic Volcanic action into the Henry Repeating Rifle, the success of which began Winchester's rocket ride to building a firearms dynasty.

Tip-ups. Not long after they wound down from the Volcanic venture, the two men soon began their second new enterprise as partners, only this time it was to produce a brand-new revolving cylinder handgun of their own design, one that would fire a self-contained rimfire cartridge designed by D. B. Wesson. Their design was for a .22 caliber revolver whose barrel was hinged at the top-front of the frame, the barrel was locked closed to the frame by a small latch at the bottom. To load or unload, the barrel latch would be operated, the user tipped up the barrel and removed the cylinder, hence the nickname "tip-up." Ejection of the spent cartridge casings was a very slow process, accomplished by first opening the barrel and removing the cylinder, then by "running each chamber through" with the small steel rod (called an ejector pin) mounted under the barrel to punch out each individual shell casing one at a time. The first of these new revolvers were produced in 1857 and are what collectors now call the Model Number 1; this unique gun was the beginning of a big step forward in the way all handguns were to be built.

A Long History...

Smith & Wessou's Model No. 1 pistol in .22 rimfire held seven shots, its barrel tipped-up for loading. Author photo.

S&Ws Model Number 1 became the first successful breech-loading, metallic cartridge revolver, and its Number 1 cartridge (today called the .22 Short) was also the first metallic cartridge to be commercially successful. Even though these pistols used a weak and very unconventional design, especially when gauged by today's standards of efficiency, they quickly gained popularity as pocket guns before the beginning of the Civil War. That was the golden age of the percussion ignition, muzzle-loading revolver so this new S&W with its comparatively fast loading ability was considered as something very special, so special that its invention eventually spelled the demise of the cap-n-ball revolver. Our two partners had learned something about legal protection as well, and before production began they secured exclusive rights to an odd patent covering the concept of a revolver cylinder with bored-through chambers held by a man named Rollin White. A patent like this, broadly covering such a well-known concept probably wouldn't be allowed to stand legally today. But stand it did in 1857, and by so doing the protection it afforded gave the little Bay-State arms company a monopoly on cartridge revolver manufacture, at least until the patent expired in 1869.



This is how S&W's tip-up barreled pistols were unloaded; the gun is a Model No. 2 in .32 rimfire. From the collection of Ed "Buddy" Wade. Author photo.

The largest of the tip-ups, the .32 rimfire Model No. 2 held 6 shots and was a popular personal sidearm with troops going off to fight in the Civil War. From the collection of Ed "Buddy" Wade. Author photo.

The little seven shot, .22 caliber Model Number 1 revolver went though a rapid series of improvements and it wasn't long before it was joined by two other revolvers of larger caliber, built on bigger frame sizes. The first of these appeared in 1861 and was called the Model Number 2, a.k.a. the Model Two Army. This was comparatively a medium-sized revolver whose cylinder held six shots in .32 long rimfire caliber. By 1865 the Model Number One & One Half was introduced; this revolver fell in between the Model 1 and the Model 2 in size, and took five .32 rimfire cartridges. Each of these larger pistols was made using the same kind of tip-up barrel arrangement, and all of the tip-up models made by S&W were chambered for rimfire calibers only.

All of S&Ws tip-up revolvers (except the Model 1 Old Model) used a cylinder stop similar to this. It was operated by the top of the hammer's firing pin and externally mounted on top of the frame where it often got snagged on the fabric of clothing. From the collection of Ed "Buddy" Wade. Author photo.

Tip-up revolvers remained popular and were kept in production seemingly well beyond the point of being obsoleted by many of the new metallic cartridge revolver designs which appeared during the 1870s. The last version of the Model 1 .22, an advanced tip-up

design known to collectors as the Model One-Third Issue, left the factory in 1888. By then, Smith & Wesson had sold more than 257,000 Model Number 1s in .22 caliber alone, and the total tip-up production for all calibers was something over 461,000 revolvers.

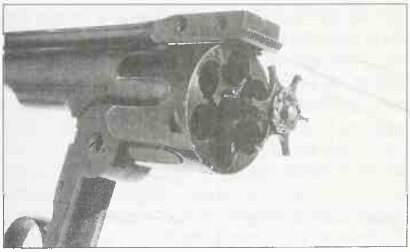
Top-break revolvers? Top breaks are not to be confused with the so-called "tip-up" revolvers introduced in the pre-Civil War era like the S&W Model Number 1 whose barrel hinged at the top-front of the lock frame. "Top-break" revolvers are handguns whose barrels hinge at the lower-front of the frame, this design was also provided with a moveable barrel latch at the top-rear of the barrel (or sometimes mounted on the frame) which fastened the barrel and frame together as a unit. When the barrel opening latch was operated, the barrel could be pivoted downward along with the cylinder, thus exposing all the chambers at once for loading and unloading. "State-of-the-art" metallic cartridge revolvers of the early 1870s used cylinders that were attached to a fixed frame, but ejection of spent cartridges was accomplished with a slow manual rod-ejection system with a separate ejector rod mounted in a tube on the barrel's side. That common design allowed only one chamber to be exposed to the loading port in the lock-frame, meaning that loading and unloading could only be done one cartridge at a time.

Top-break revolvers like this Navy Arms replica of the S&W Russian, break open at the top of the frame and their barrels hinge downward, offering a very fast reload. Revolver courtesy Navy Arms. Author photo.

With S&W's top-break revolver, once the gun is opened the back of the cylinder becomes completely exposed, and the extraction and ejection of all fired cartridge cases occurs automatically and simultaneously while the barrel is pivoted down and opened. When the Smith & Wesson top-break first appeared in 1870 with all these automatic features, it offered a huge advantage in speed of loading and unloading over the rod-ejector-type revolvers then so common. These advantages could be very important to military organizations, especially to cavalry units who went into combat on the back of a horse where the possible one-handed manipulation of a revolver mechanism could be a terrific advantage.

1869 was the year when Smith & Wesson's exclusive rights would expire on that infamous Rollin White patent; the one giving them sole use of the cylinder bored straight through to hold rimmed cartridges. This small but high-quality company had built its fortune using that patent since 1857 by producing small- and medium-sized Model #1, #1 and #2 "tip-up" pistols in .22 and .32 rimfire calibers. As the legal protection of the patent expired, the door opened wide for heavy competition from other U.S. arms makers, some much larger than S&W, who had been patiently waiting for the lapse of that document. Mr. Smith and Mr. Wesson didn't wait long to get moving either: They began the top-break era late in 1869 by introducing the world to their Model No. 3, a.k.a. the .44 American. The design itself broke with many of the accepted traditions of the era; it was the first Smith & Wesson top-break revolver and the beginning of several great strides forward both for S&W and for the firearms industry. This new pistol was also S&W's first attempt to manufacture a large caliber center-fire revolver that had a size and power level compatible with the .44 Colt 1860 Army Model revolver, the gun considered the standard by which a "good" revolver could be judged.

The unusual new revolver was based on the basic patents of C. A. King (simultaneous ejection) and W. C. Dodge (hinged opening action) and first called the Model Number 3. It used a barrel that pivoted forward on a large hinged joint at the bottom-front of its lock frame. This new revolver was not only compatible in size and power with most popular percussion and metallic cartridge six-guns, it also featured something none of the other revolvers had: simultaneous, automatic ejection of its spent cartridges. This unique mechanism was operated by action of the barrel *breaking,* (hence the term top-break) or tilting downwards on opening; this activated a pawl that in turn caused a clever rack-and-gear system to raise up the extractor out of the cylinder pulling the spent cartridge casings from their chambers. When the barrel had reached its farthest downward point, the rear of the barrel pressed on a frame-mounted ratchet-pawl; this deactivated the rack and gear and allowed the extractor to be pulled back into the cylinder by a coil spring. This whole operation could be accomplished with one hand if needed!

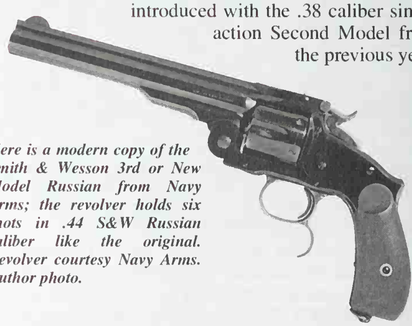


Smith & Wesson's top-breaks like this 1876 production U.S. Army .45 caliber Schofield revolver were very advanced for their day; when the barrel was opened the entire rear face of the cylinders was exposed and they all featured simultaneous, automatic ejection. From the collection of Ed "Buddy" Wade. Author photo.

Smith & Wesson's introduction of the Model #3 had a staggering effect on the arms industry. At last, the partners had a modern military revolver that in almost every way was far ahead of anything the other arms makers were producing. As the new S&W was released in 1870, Colt's solid-frame-single-action design (the Single Action Army) was still on the drawing boards and wouldn't appear until 1873. Even so, when compared to the new S&W, the yet-to-be-built Colt suffered from that same slow ejection system, really only a streamlined version of the barrel-mounted rod-ejector system used on earlier percussion-conversion revolvers. There were and are some valid arguments for the simplicity of design, strength and fewer moving parts inherent in the solid frame Colts and Remington revolvers over the more complicated, though efficient jointed-frame top-break types. In the United States, the Army agreed with this argument, and in 1873 they adopted the Colt SAA over the Smith & Wesson for their service revolver. Still, the Smith & Wesson pistols were extremely well-made firearms, and given moderate care during use, worked well enough in the field while at the same time offering the great practical advantage in speed of loading and unloading. These features were obviously of greater importance to other world large military organizations, who soon began to equip their troops with the more advanced S&W revolver.

During the 1870s, S&W sold tens of thousands of their .44 caliber top-break revolvers to Russia (a spinoff from these Russian contracts was the famous S&W .44 Russian center fire cartridge), and a few thousand more to Turkey and Japan. In 1871 the U.S. Army contracted for 1000 .44 S&W caliber (later called the .44 S&W American center fire) Model No. 3 revolvers although after field trials decided not to purchase more. The Army returned to the top-break in a small degree in 1875, and eventually purchased almost 9,000 S&W Model No. 3 Schofield revolvers in .45 S&W caliber. S&W's Schofield used the basic Model No. 3 frame, but with patented alterations by U.S. Army Major George W. Schofield. Schofield's modifications turned the Model No. 3 into a much more practical revolver for cavalry use (the barrel latch was pulled to the rear with the thumb of the shooting hand instead of having to be lifted up with the off-hand, as with the regular Model No. 3, this made opening the barrel an easy, one-handed operation); he also simplified the S&W extraction system.

By 1876 S&W began to manufacture a medium-frame size top-break revolver, called the Model No. 2 .38 single action, along with the cartridge it would use which became the famous .38 S&W center-fire. This first revolver was nicknamed the "Baby Russian" not only because of its similarity to the current production Third, or "New Model" Russian .44 revolver, but because it shared a scaled-down version of the Russian type rack-and-gear-extraction mechanism which necessitated a long extractor housing under the barrel. This new .38 single action held five shots and used a spur-type trigger encased in the frame with no separate trigger guard. Smith & Wesson quickly evolved the top-break revolver during this period. 1877 saw the introduction of a redesigned Model No. 2 .38 single action which is now called the Second Model. This is a key top-break model because many of the new features S&W introduced for the first time on this gun would be molded into future models of top-break revolvers in all sizes. A new, much more dependable and simplified extraction system was introduced here which enabled the extractor housing under the barrel to be shortened, which improved the pistol's appearance though the spur-type trigger was retained. The method of cylinder retention was also simplified in 1877; the separate cylinder retainer and its screw were eliminated. In place of these parts the Second Model .38 single action used an interrupted thread on the base pin (that corresponded with an interrupted thread on the inside of the cylinder's center hole) to keep the cylinder in place while the barrel was opened, a small lug was added to the bottom flat of the barrel catch to keep it from moving to the rear during extraction. This new cylinder retention system worked so well that it became the final standard design that would soon be applied to all frame sizes of their commercial top-breaks (except the Schofield) and would be kept until the end of top break production in 1940. A pocket-sized revolver was added in 1878 with the introduction of the Model No. 1 .32 center-fire single action; also a spur triggered revolver, as well as a redesigned large-frame single action which was known as the "New Model Number 3." these new revolvers incorporated many of the improved features first introduced with the .38 caliber single action Second Model from the previous year.

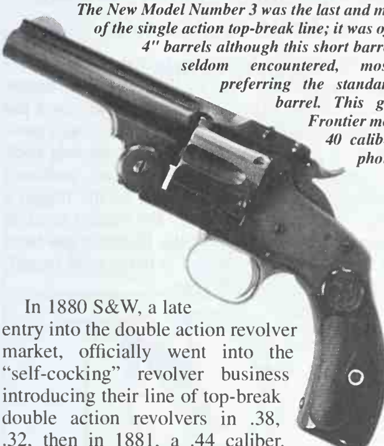


Here is a modern copy of the Smith & Wesson 3rd or New Model Russian from Navy Arms; the revolver holds six shots in .44 S&W Russian caliber like the original. Revolver courtesy Navy Arms. Author photo.

Abroad and at home the S&W top break design quickly gained popularity, even being produced under license by Ludwig Lowe in Berlin and at Tula Arsenal in Russia. Copies of the S&W top-break began to appear all over the world soon after its introduction, produced both abroad and at home in America. Arms companies with familiar names such as Harrington and Richardson, and Iver Johnson's Gun and Cycle Works were among countless other companies who made top break revolvers of lesser quality than Smith & Wesson

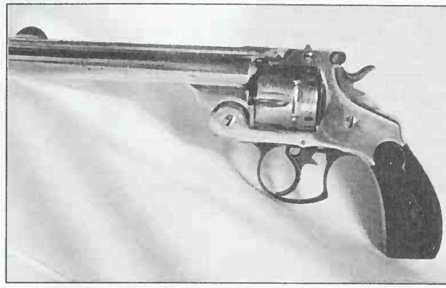
and meant to be sold at lower cost than the S&W for many years, in fact well into the 20th century. There is no way to tell but I wouldn't doubt they exceeded even S&Ws total production.

This is the old-fashioned box Navy Arms supplies with their Mod. 3 New Model Russian .44 revolver. Author photo.



The New Model Number 3 was the last and most refined of the single action top-break line; it was offered with 4" barrels although this short barrel length is seldom encountered, most buyers preferring the standard 6 1/2" barrel. This gun is the Frontier model in .44-40 caliber. Author photo.

In 1880 S&W, a late entry into the double action revolver market, officially went into the "self-cocking" revolver business introducing their line of top-break double action revolvers in .38, .32, then in 1881, a .44 caliber. The last was based on the New Model No. 3 lock frame, and the former on the .38 and .32 single action frame sizes, all shared S&W's famous automatic ejection. The company produced 327,641 of the .32 Double Actions up to 1919, and manufactured more than 554,000 of the slightly larger .38 Double Actions until end of production in 1909. Sometimes called "New Departures" or commonly "Lemon Squeezers," these Safety Hammerless Smith & Wesson models appeared in 1887 and 1888 respectively with the introduction of the .38 and .32 caliber revolvers. These pistols were very similar in appearance to the double action models without exposed hammers, and being double action only. Hammerless models could not be fired until the grip was squeezed, thus depressing a safety lever at the rear-grip frame. At the end of their production in 1937, a total of 242,981 .32 Safety Hammerless revolvers had been made, and by 1940, as the very last Smith & Wesson top-break revolver was sold;a .38 Safety Hammerless, marking over 261,000 of this model that had been produced.



Introduced in 1881, S&W's large-framed .44 double action sported an unusual double set of cylinder stop notches and lead cuts for the front stop, making for an unusual appearance. Most of these were chambered in .44 S&W Russian caliber. From the Sidney Baker collection. Author photo.

For only a short span of time (from 1879 to 1887), S&W built revolving rifles that were based on the New Model No. 3 lock-frame. Scarce collectors items today, in total 977 revolving rifles were made and all of them were chambered in .320 S&W revolver rifle caliber. Single shot target pistols were also manufactured by S&W on the top-break frame starting in 1893. The first of these single shot pistols were built on the .38 Single Action, 3rd model frame, and were offered with factory optional revolver barrels and cylinders. Subsequent models of single shot pistols were made on special lock frames intended only for single shot use. The 3rd, or Perfected Model Single Shot, was the last of these and was built on a modified .38 Perfected top-break revolver frame. Perfected Model .38 revolvers were a strange top-break variant, a hybrid of the qualities of the top-break's barrel system mixed with the modern .32 Double Action Hand Ejector lock frame. This unusual revolver was equipped with some advanced safety features; to open a Perfected Model revolver for loading you had to lift the barrel catch and at the same time depress the thumb-piece on the frame side; approximately 59,000 .38 Perfected Models were manufactured from 1909 up to 1920.

Smith & Wesson's production of top-break handguns continued right alongside their more modern, side-swing cylinder hand ejector models until 1940, when the last top-break revolver rolled off the assembly line. 1940 marked the end of the top-break era for Smith & Wesson, an era which spanned seventy years during which the Smith & Wesson company alone manufactured roughly one and one-half million handguns based

on the top-break system. That last gun was serial #261,493; a .38 Safety Hammerless, 5th Model and it would be the last top-break revolver to be manufactured by S&W until the year 2000, when the .45 Schofield was re-introduced by Smith & Wesson; a full 130 years after they brought us the first .44 caliber Model No. 3 top-break revolver in 1870.

The classic top-breaks return: Cowboy Action Shooting, this new and seemingly ever-growing sport; has generated a large amount of renewed interest in the classic Smith & Wesson top-break style revolver, enough so that several arms makers have gone into their production. Present day reproductions are made of modern steel alloys so they are safe to fire with off-the-shelf smokeless ammunition and are equipped with a feature the originals never had: hammer block safety devises. Cimarron Firearms in Fredericksburg, Texas (made by Armi San Marco), Navy Arms of Ridgefield, New Jersey (made by Uberti), and even Smith & Wesson themselves have gone into the production of modern-made, shootable replicas of these big top-breaks.

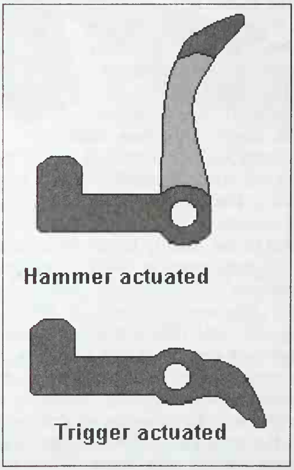
A pair of Navy Arms .45 Schofields, the top revolver is the standard 7" cavalry length while the bottom gun is the 3" "Pocket Model." Revolvers courtesy Navy Arms. Author photo.

No longer available, the Cimarron Firearms ASM reproduction was a wonderfully faithful copy of the S&W First Model Schofield. Produced in .45 Colt, its life span was unfortunately shortened, we are told by unreliability at the Armi San Marco factory in Italy. Navy Arms has been importing reliable shooting replicas of the Second Model Schofield in .45 Colt and .44/40 Winchester calibers, and lately a replica of the Third Model Russian, which is chambered in the original Russian caliber. Both Navy Arms revolvers are manufactured in Italy by Aldo Uberti, and both are proving themselves a success on the shooting ranges, gaining more in popularity each week. I have yet to get my hands on one of the new Smith & Wesson made re-introductions of their own First Model Schofield. I am told they are offered in the original .45 S&W Schofield caliber, and it should be a very popular item, assuming that is, they can get their prices down closer to the imported Schofield. One interesting feature reported to be on the new production S&W Schofield is a floating firing pin, supposedly along with a hammer block safety. After being absent for 50 years, it would seem the top-break revolver is still continuing to evolve and is making a come-back. With any luck at all, both the sport of Cowboy Action Shooting and these classic top-break revolvers will be with us for another 130 years.

How top-break actions operate: To the modern shooter who may not have had much experience with these 19th-century firearms, the operation of the top-break's mechanism may present something of a dilemma. For your benefit and to help you familiarize yourself with the designs, here in the following descriptions is an explanation of what happens when the hammer is cocked, the trigger pulled, or both.

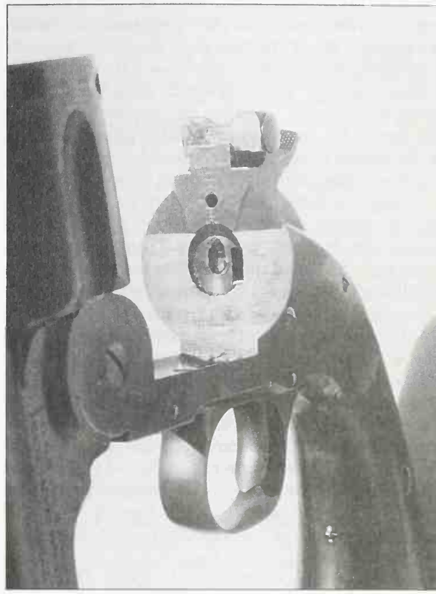
Action Operation: Smith & Wesson top-break single actions

Smith & Wesson top-break single actions will operate as single actions only, their hammers must be manually pulled to the rear to rotate the cylinder and cock the weapon. These revolvers have two hammer notch positions (clicks). The first hammer notch is the half-cock position (often mistakenly called a safety position) where the hammer is placed and held by the trigger's sear during loading and unloading. The second notch is the fully-cocked position where the hammer has been pulled all the way to the rear and is being held staged, "ready to fire" by the trigger's sear.

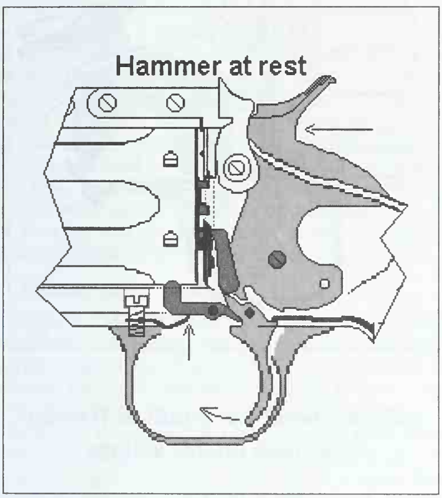


S&W single action top-break revolvers used two types of cylinder stops (Colt called this a bolt). The first was hammer actuated (Type I) in a fashion similar to the Colt SAA and was used only on early .44 American Models up until roughly the serial #20,000 range. At this point S&W switched to a trigger actuated (Type II) cylinder stop and this design was used throughout the remainder of their production of top-break revolvers in all calibers and frame sizes.

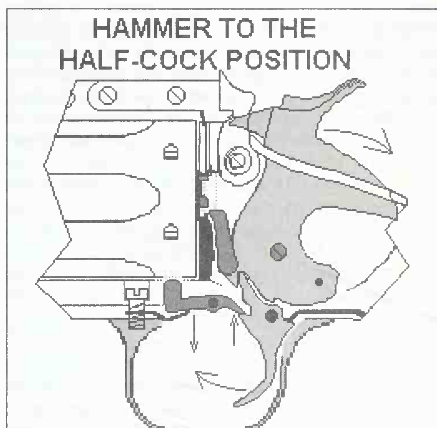
Here is what happens inside a top-break single action S&W as the hammer is pulled to the rear:



When the hammer is placed at half-cock, the firing pin should not be sticking through the frame and the cylinder stop should be down. Author photo.



Hammer at rest position: When the hammer is all the way down, held there by the strong tension of the mainspring, another spring tension from the cylinder stop spring is pushing on the front of the cylinder stop causing it to pivot up so its "ball" or bolt protrudes through the frame opening and into the cylinder's stop notch, thereby preventing cylinder rotation. The trigger is mounted on a pivot pin low in the frame, below the hammer and it is under constant pressure from the trigger spring causing it to pivot forward, in so doing its sear area is being forced up against the bottom of the hammer's sear area.



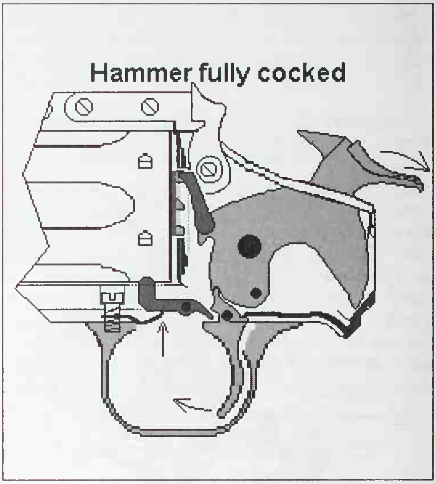
Hammer to the half-cock position: As the hammer spur is pulled back toward the rear, the hammer is rotated on the hammer stud (its pivot) in the frame until the first sear notch; the safety or half-cock notch is reached. This notch is the first hammer notch encoun-

tered by the trigger sear and since the notch is rather deep and farther away from the trigger sear, the sear follows the contours of the bottom of the hammer up into the notch by virtue of the spring tension it is under from the trigger spring. **Type I cylinder stop:** On the front face of the hammer is a stop cam which because the front face of the hammer has begun to pivot upward, is now beginning to put pressure forward on the top leg of the cylinder stop, causing it to pivot forward. The trigger spring is now overcoming the tension from the cylinder stop spring, so the cylinder stop's front is pivoted down so that its "ball" leaves the cylinder stop notch, freeing the cylinder to rotate. As the trigger sear enters the half-cock notch, it pivots forward and if the hammer is now gently released, the tension of the mainspring tries to rotate the hammer forward but it will be retained at the half-cock position by the trigger's sear which has fallen into the hammer's half-cock notch. **Type II cylinder stop:** As the trigger sear is pushed up into the deeper half-cock notch by the fairly strong tension of the trigger spring, it pivots forward and in so doing its stop cam surface pushes up on the tail of the cylinder stop. Since the cylinder stop is mounted on a pivot pin, the stop is forced to pivot so that its front or "ball" end drops down out of the cylinder's stop notches, the trigger spring overcoming the tension from the cylinder stop spring, freeing the cylinder to rotate. Should the hammer be gently released, the tension of the mainspring will try to rotate the hammer forward where it will be retained at the half-cock position by the trigger's sear which has fallen into the hammer's half-cock notch.

Hammer to the full-cock position: As the hammer is pulled farther to the rear, out of the half-cock position, the trigger's sear again follows the contours of the hammer bottom which is now tapering lower and closer to the trigger, causing the trigger to rotate rearward. As the lower-forward portion of the hammer pivots upward, the hand which is mounted there rises up within its window in the lock frame to engage the ratchet teeth, tension placed on it by the hand spring forces the top of the hand forward, keeping it engaged with the ratchet tooth. As the hand engages the ratchet tooth it pushes the left side extractor ratchet, hence the cylinder upwards; and since the cylinder stop has been previously disengaged from the cylinder, this action forces the cylinder to rotate clockwise.

As this is occurring and the hammer continues to rise. **Type I cylinder stop:** The stop cam leaves the cylinder stop leg, freeing the cylinder stop leg to again move forward as the stop pivots and its "ball" end moves upward allowing it to again reach the cylinder stop notch which it will enter once the cylinder has been revolved completely into battery by the hand. **Type II cylinder stop:** As the trigger sear is pushed up out of the half-cock notch while it is following the rising contour on the bottom of the hammer, the trigger is being forced to pivot rearward and as it does it releases the cylinder stop tail, freeing the cylinder stop so it can be pushed back up once again by the tension of the cylinder stop spring until its "ball" end moves up far enough to again reach the cylinder stop notch which it will enter once the cylinder has been revolved fully into battery by the hand.

As the hammer nears its fully rearward position, the trigger's sear engages the full-cock notch of the hammer, being pushed into the notch by trigger spring tension; at that point the trigger's tip is also pivoted slightly forward. Here the hammer is "staged"; held at full-cock in the "ready to fire" position until the trigger is pulled, releasing the hammer which will fall forward to fire the cartridge in the cylinder's chamber by virtue of the heavy mainspring tension acting upon it.



Action Operation: Smith & Wesson top-break double actions

Smith & Wesson top-break double action revolvers can be operated either by manually pulling the hammer to the rear causing the cylinder to rotate and cocking the weapon and then pulling the trigger to fire the gun, or by simply pulling the trigger, in other words in single or double action modes. These revolvers have two single hammer notch positions or "clicks". The first hammer notch is the half-cock position or so-called safety position, where the hammer is placed (either by pulling it rearward slightly with the thumb or by pulling the trigger to move the hammer back slightly), and held by the rear sear during loading and unloading. The second notch is the fully-cocked position where the hammer has been pulled in single action mode all the way to the

rear and is being held staged, "ready to fire" by the rear sear.

S&W double action top-break revolvers used two types of cylinder stops (Colt called this part a bolt). The first used in the early (1st and 2nd models) .32 and .38 caliber models and in all of the .44 caliber models was a two-piece (Type A) cylinder stop. The front stop was in use only when the trigger was all the way forward to keep the cylinder from rotating and a rear "rocker-type" cylinder stop mounted within the trigger and requiring two sets of cylinder stop notches as well as long "leads" in the cylinder for its operation. All 3rd and later models .32 and .38 caliber double actions used a more conventional cylinder stop which was actuated by the rear sear (Type B) and this design was used throughout the remainder of their production of double action top-break revolvers in all calibers except the .44.

These revolvers use two separate searing mechanisms, one for single action only called the *rear sear,* and the second which is used for double action only called the *front sear.* The rear sear is frame mounted, being pivoted on a cross-pin just below the hammer and behind the trigger where it may engage the hammer sear notches directly, it is powered by a leaf spring mounted in the front grip strap. The front sear is mounted on the trigger along with the hand and moves with the hand as the trigger pivots them both upward when the trigger is pulled to the rear. Spring tension for the front sear is provided by the leaf-type hand spring which bears forward on the hand at the same time it bears rearward on the front sear, constantly pressing the sear toward the double action sear at the front of the hammer.

Here is what happens inside a top-break double action S&W as the action is operated:

Hammer at rest position:

Type A Cylinder Stop: When the hammer is all the way down, held there by the strong tension of the mainspring, the front or "fixed" cylinder stop protrudes up through the frame opening and into the cylinder's forward stop notch, thereby preventing cylinder rotation. The trigger is mounted on a pivot pin, low in the frame below the hammer and it is under constant pressure from the trigger spring causing it to pivot forward. **Type B Cylinder Stop:** When the hammer is all the way down, held there by the strong tension of the mainspring, the cylinder stop protrudes up through the frame opening, its tension supplied by its front portion which is its spring, and into the cylinder's stop notch, thereby preventing cylinder rotation.

Hammer to the half-cock position: In **single action mode;** as the hammer spur is pulled back toward the rear, the hammer rotates on the hammer stud (its pivot) in the frame, since the front sear is engaged with the double action sear on the hammer face; as the hammer moves rearward it pulls up on the front sear causing the trigger to rotate slightly to the rear also. Or, in **double action mode;** as the trigger is pulled slightly to the rear, the front sear pushes the hammer up, rotating it slightly to the rear:

Until the first sear notch; the safety or half-cock notch is reached. This notch is the first hammer notch encountered by the rear sear and since the notch is rather deep and farther away from the rear sear, the rear sear follows the contours of the bottom of the hammer as its rear pivots up into the notch by virtue of the spring tension it is under from the rear sear spring. If the hammer is gently released, the tension of the mainspring will try to rotate the hammer forward but the hammer will be retained at the half-cock position by the rear sear which has fallen into the hammer's half-cock notch. **Type A cylinder stop:** The trigger is now pulled slightly to the rear, causing the front cylinder stop to pivot down, out of contact with the cylinder which frees the cylinder so it may rotate. **Type B cylinder stop:** The trigger is now pulled slightly to the rear; tension from the rear sear spring pivots the back of the rear sear up into the deeper half-cock notch as the front of the rear sear pivots down, pushing on the tail of the cylinder stop and causing it to drop down out of the cylinder's stop notches, freeing the cylinder to rotate.

Hammer to the full-cock position: As the hammer is pulled farther to the rear, or as the trigger is pulled out of the half-cock position, the rear sear again follows the contours of the hammer bottom which is now tapering lower and closer to the trigger, causing the rear sear to rotate forward. As the lower-forward portion of the hammer pivots upward, the hand which is mounted there rises up within its window in the lock frame to engage the ratchet teeth, tension placed on it by the hand spring forces the top of the hand forward, keeping it engaged with the ratchet tooth while at the same time this spring acts rearward against the front sear, holding it against the front of the hammer. As the hand engages the ratchet tooth it pushes the left side extractor ratchet, hence the cylinder upwards; and since the cylinder stop has been previously disengaged from the cylinder, this action forces the cylinder to rotate clockwise.

As this is occurring and the hammer continues to rise: **Type A cylinder stop:** The trigger has now rotated farther rearward, thereby exposing the rear cylinder stop fully to its window in the frame, here the stop rotates as its rear end moves up, being under tension from a coil spring, the stop pivots and its "ball" end moves upward, reaching into the cylinder's stop notch which it will enter and lock once the cylinder has been revolved completely into battery by the hand. **Type B cylinder stop:** As the rear sear is pushed up out of the half-cock notch as it follows the rising contour on the bottom of the hammer, the rear sear is being forced to pivot rearward; as it does it releases the cylinder stop tail, freeing the cylinder stop so it can be pushed back up once again by its own spring tension until its "ball" end moves up far enough to again reach the cylinder's stop notch which it will enter once the cylinder has been revolved fully into battery by the hand.

Single action firing mode: As the hammer nears its fully rearward position, the rear sear engages the full-cock notch of the hammer being pushed into the notch by rear sear spring tension. Here the hammer is "staged"; held at full-cock in the "ready to fire" position until the trigger is pulled. When the trigger is pulled all the way the front sear over-cams with the trigger and is thus pulled forward, out of its engagement with the hammer's double action sear; at this time the rear of the trigger contacts the bottom-front of the rear sear, this causes the rear sear to pivot in the opposite direction releasing the hammer which will fall forward to fire the cartridge in the cylinder's chamber by virtue of the heavy mainspring tension acting upon it.

Double action firing mode: Pulling the trigger fully causes the hammer to move all the way to the rear by the action of the front sear which is fully engaged with the double action sear on the hammer. As the trigger reaches its rearward-most position, it contacts the rear sear and causes it to pivot down out of any possible engagement with the hammer's sear area; immediately following this the front sear over-cams with the trigger and is pulled forward, out of engagement with the hammer's double action sear, releasing the hammer which will fall forward to fire the cartridge in the cylinder's chamber by virtue of the mainspring tension acting upon it.

Action Operation: Smith & Wesson top-break safety hammerless revolvers

Smith & Wesson top-break safety hammerless, which were sometimes called New Departure or Lemon-Squeezer revolvers are all double action only, meaning they may only be fired by pulling the trigger since they have no exposed hammers to manually operate.

Here is what happens inside a top-break safety hammerless S&W as the action is operated:

Hammer at rest position:

When the hammer is all the way down, held there by the strong tension of the mainspring, and the trigger is all the way forward, the cylinder stop protrudes up through the frame opening, and into the cylinder's stop notch, thereby preventing cylinder rotation. The cylinder stop's tension is being supplied by the cylinder stop spring; a leaf-type spring that is mounted within the front grip strap. The hammer does not reach the firing pin because it is being pulled slightly to the rear by a knuckling action of the hammer's stirrup reacting against mainspring tension. The firing pin itself is floating and spring loaded, held naturally to the rear when there is no hammer contact. Unless the handle is being gripped tightly which would cause the safety lever at the rear of the grip to be moved inward, a spring powered safety bar effectively blocks the hammer so it cannot move to the rear if the trigger is pulled unless the safety lever has been depressed.

Cocking:

As the gun is gripped and the shooting hand squeezes the grip, the safety lever is compressed; this causes the safety itself to pivot rearward, out of the hammer's path of travel. Now when the trigger is pulled the sear, which is mounted on the trigger along with the hand and is being pushed rearward by tension from the handspring, engages with the hammer's sear and so the hammer is forced to rotate rearward. As it does the front-blunt end of a small cam (the cylinder stop cam) machined on the hammer's bottom contacts the blunt side of the cylinder stop split spring, causing the cylinder stop to pivot downward; thereby unlocking the cylinder so that it is now free to rotate. The hand, which is being pushed forward into the cylinder's ratchet tooth by opposite tension from the hand spring, engages a ratchet tooth and causes the cylinder to rotate.

As the trigger moves farther to the rear it carries the cylinder toward battery as the stop cam moves away from the cylinder stop spring, enabling the spring powered cylinder stop to return to the up or locked position, where it will lock the cylinder as it is revolved into battery by the hand. At the point where the trigger reaches its fully rearward point of travel, the cylinder is now locked into battery; continued rearward pressure on the trigger causes the front sear to over-cam with the trigger so that it is pulled forward and out of engagement with the hammer's sear, thus allowing the hammer to fall under the heavy tension of the mainspring.

And firing:

As the hammer falls forward, the rear-pointed end of cylinder stop cam contacts the rear-tapered ends of the split spring causing them to spread apart, thereby the cylinder stop cam passes through the split spring without operating the cylinder stop as the hammer falls. Under heavy tension of the mainspring and the momentum of falling, the speeding hammer momentarily overcomes the knuckling action of the stirrup and contacts the firing pin, driving it forward with its full force into the cartridge primer. Bear in mind, the hammer only contacts the firing pin momentarily while it is moving under tension and inertia; after contacting the firing pin the mechanical knuckling action of mainspring tension against the stirrup causes the hammer to move slightly rearward to where it is just out of contact with the firing pin. Releasing the trigger allows the trigger spring to return it to its forward-most position where the tension from the hand spring again pushes the sear into engagement with the hammer sear. Releasing or loosening the grip on the grip safety lever will allow the safety to move into interference with the hammer's operation.

Smith & Wesson's rimfire "tip-up" revolvers: common repairs.


THE SEVEN SHOOTER.

SMITH & WESSON'S

PATENT REVOLVER.

The above is a full size drawing of the No 1 Pistol.
It is the lightest Revolver in the world. and shoots with as
much force as any other arm. Weight only 10 oz.

DIRECTIONS FOR USE.

J. W. STORRS, Sole Ag't,

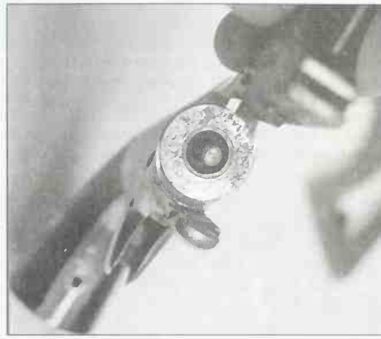
121 Chambers Street, [up stairs,] New-York.

N. B.—These Cartridges are sure fire in this Pistol, but are not warranted in other kinds of Pistols.

The seven shooter. An instruction sheet from a Smith & Wesson Model 1 1st Issue tip-up revolver, circa 1859.

Historical background.

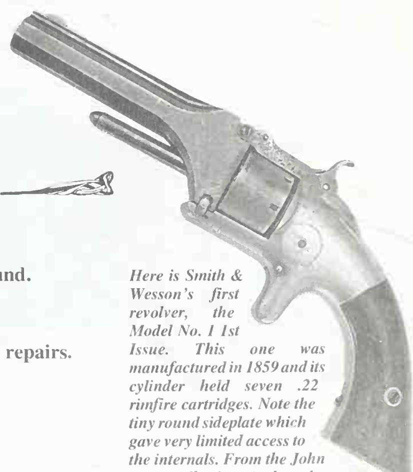
The first Smith & Wesson Tip-up revolver, or what collectors now call the *Model Number One,* was the beginning of a major step forward in handgun design. These crude little revolvers may not look like much today, but the tiny Model Number 1 revolver was the world's first successful breech-loading, metallic cartridge firing handgun and its cartridge, what we know today as the .22 Short caliber, was our first commercially successful metallic cartridge. Although these revolvers used a relatively weak and somewhat unusual design, especially when viewed by modern-day standards, the wonderful craftsmen at the Smith & Wesson factory managed to produce them with such superb machine and finish work that they quickly became popular as pocket and *hide out* guns before, during and even well after the Civil War. In that age of cap-n-ball, muzzle loading revolvers the Model Number 1 with its relatively quick loading Smith & Wesson designed .22 caliber rimfire cartridge, and the Rollin White patent on bored-through cylinder chambers as their legal protection, this infant Massachusetts company gained a clear edge on their competition and quickly blossomed to maturity. Production of the rapidly evolving .22 caliber Model Number 1 revolver was soon supplemented by two revolvers of larger frame size, both made in the same basic tip-up barrel configuration; the Model Number 1 1/2 with five shots, and the Model Number 2, sometimes called the *Model Two Army* which held six shots, each gun chambered in .32 rimfire caliber. All of the S&W tip-up models were chambered in rimfire calibers only.



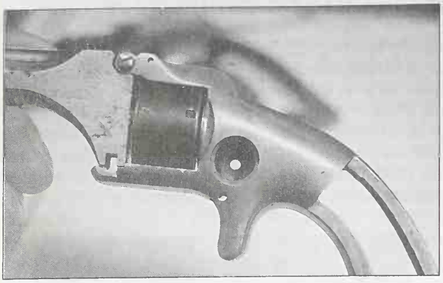
Looking beyond a tipped-up tip-up's barrel, we see the steel breech face of the Model No. 1 1st Issue Smith & Wesson which was screwed into the revolver's bronze frame. The stud at the center of the breech is the cylinder's rear axle. Author photo.

Tipping Up!

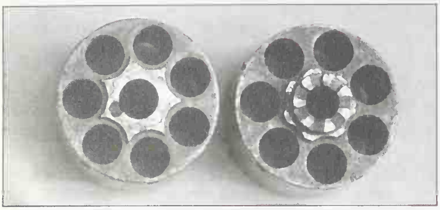
Historical background.
Safety cautions.
Hinge repairs.
Cylinder end-shake repairs.
Cylinder stops.



Here is Smith & Wesson's first revolver, the Model No. 1 1st Issue. This one was manufactured in 1859 and its cylinder held seven .22 rimfire cartridges. Note the tiny round sideplate which gave very limited access to the internals. From the John Watts collection. Author photo.



Shown partially disassembled, this close-up of a Model No. 1 First Issue revolver clearly illustrates the tiny half-inch diameter round sideplate opening which, for the gunsmith, offers the only entry into the hammer. The sideplate itself is threaded to accept the hammer pivot screw which passes completely through the frame. Author photo.



Early Models Number 1 (left) cylinder used a rotating ratchet plate with a drive pin that revolved the cylinder up until May or June 1859 (with the introduction of the Sixth Type) when the rotating plate was eliminated in favor of a ratchet that was machined onto the rear of the (right) cylinder. Notice that the outside of the chamber walls appear paper thin. Author photo.

Close-up shot showing the Model 1's two-piece hammer in the cocked position. When the hammer is down and the spur is pulled backwards, the top section of the hammer pivots up, pushing the cylinder stop up and unlocking the cylinder so it may rotate. From the John Watts collection. Author photo.

These early Smith & Wesson revolvers have come to be known as the *tip-ups* because their barrels are hinged at the top-front of the lock-frame. When the barrel latch at the frame bottom is operated, the barrel is "tipped-up" which exposed the cylinder and allowed it to be removed so that it could be loaded with cartridges and replaced. Unloading the revolver after it was fired was accomplished by first opening the barrel, removing the cylinder and then manually sliding each chamber one at a time, over a simple, fixed ejector pin (rod) that was mounted under the barrel until each shell casing had been ejected. The cylinder could then be reloaded and re-installed into the revolver.

The Model No. 1 opened showing the method of extracting spent cartridges with the cylinder placed over the extractor rod. Slow and clumsy by today's standards, but this was state of the art in 1858. From the John Watts collection. Author photo.

The Smith & Wesson tip-up, rimfire models:

Model No. 1 - 1st Issue: Caliber .22 rf, 7 shots, octagon barrel, square butt grip, bronze frame with circular sideplate. Manufactured 1857-1860. Serial #1-11,671.

Model No. 1 - 2nd Issue: Caliber .22 rf, 7 shots, octagon barrel, square butt grip, bronze frame with irregular shaped sideplate. Manufactured 1860-1868. Serial #11,672-126,361.

Model No. 1 - 3rd Issue: Caliber .22 rf, 7 shots, round barrel, round butt grip, steel frame with irregular shaped sideplate. Manufactured 1868-1881. Serial #1-131,163.

Model No. 1 Old Model: Caliber .32 rf, 5 shots, octagon barrel, square butt grip, cylinder stop mounted under frame. Manufactured 1865-1868. Serial #1-26,300.

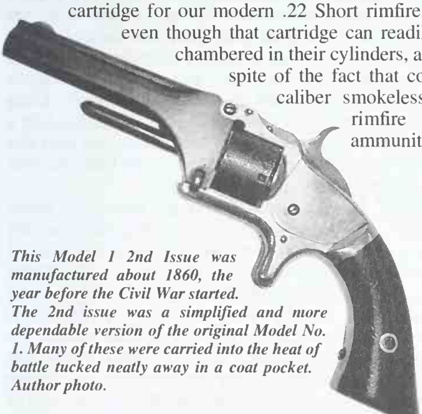
Model No. 1 New Model: Caliber .32 rf, 5 shots, round barrel, round butt grip, cylinder stop mounted on top of frame. Manufactured 1868-1875. Serial #26,301-127,100.

Model No. 2: Caliber .32 rf, 6 shots, octagon barrel, square butt grip. Manufactured 1861-1874. Serial #1-77,155.

From the top; The Model No. 2 Army with 6 shots in .32 rf was the largest of Smith & Wesson's tip-up revolvers. A Model No. One and One Half New Model which held 5 .32 rf cartridges. Author's collection. Last generation or Third issue Model No. 1 was the only Model No. 1 made with a steel frame. The little pistol that started it all; a Model No. 1 1st Issue, 5th type, circa 1859. From the Author's and the John Watts collection. Diana Boone photo.

Safety precautions:

A strong caution: For the knowledge of the collector, the arms dealer and the working gunsmith, every one of these Smith & Wesson tip-up revolvers were manufactured in the black powder cartridge era. As a matter of fact, the newest S&W tip-up revolver you could possibly find would have been manufactured in 1881. Even though the .22 Model Number 1 cartridge was the parent cartridge for our modern .22 Short rimfire, and even though that cartridge can readily be chambered in their cylinders, and in spite of the fact that correct caliber smokeless .32 rimfire ammunition of modern manufacture is available to fit the larger Models 1 1/2 and Model 2: None of these revolvers should be considered safe to fire. Please carefully consider the following statements; 1) Both because of their design and their age, all of these revolvers should be considered unsafe to shoot with modern, smokeless powder ammunition under any circumstances. The only circumstances where shooting these revolvers might, hypothetically be safe, would be with black powder rimfire cartridges; however, since such cartridges have not been loaded commercially for at least 80 years, any original ammunition would be considered too old and therefore unsafe to fire. 2) I would strongly advise any gunsmith who is repairing these pistols professionally to take the time to pass along this information in writing to the gun's owner, preferably in a conspicuous location on the front face of the repair invoice.



This Model 1 2nd Issue was manufactured about 1860, the year before the Civil War started. The 2nd issue was a simplified and more dependable version of the original Model No. 1. Many of these were carried into the heat of battle tucked neatly away in a coat pocket. Author photo.

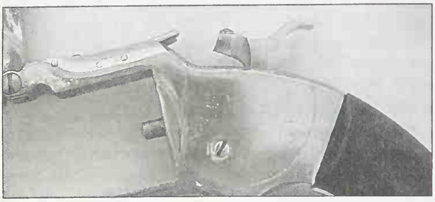
Hinge repairs:

A big part of the reason this tip-up revolver design has been considered weak is the rather delicate barrel hinge area, which can be easily damaged and is highly prone to wear. Most of us have owned or at least seen Smith & Wesson tip-up revolvers that seemed in otherwise good mechanical condition, but with barrels that wobbled around from side to side, or up and down. As a rule, these same "loose barrel guns" will also exhibit a problem with excess cylinder end-shake (front-rear movement.) In most cases all of these faults may be repaired and the procedures to do so are, like the revolvers themselves, relatively simple gunsmithing operations. Rest assured though, that as with most antique arms, it is possible to do even more damage to the gun if care is not used during the repair process.

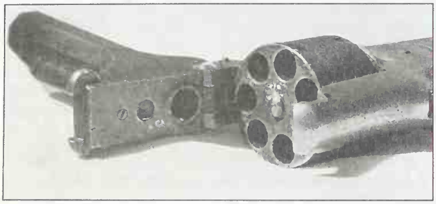
In the photo is a typical tip-up frame/barrel showing the hinge area and as you can see the screw which passes through the hinge also acts as the hinge pin. If the barrel is wobbling sideways on the frame then the screw's shank is worn and so is the screw's hole through the barrel. When that barrel hole has gotten worn very much larger than standard, simply replacing the screw with a new screw in the standard size will do you little or no good. Sure, the new part will make the gun look better, but it won't do much to tighten the barrel hinge.

Here is a Model #2 that was originally manufactured in 1865, in more recent years someone has re-plated the revolver. From the Kent Moshier collection. Author photo.

The correct cure for this looseness is to make a new screw which is sized by the gunsmith to fit the worn hinge. This screw will also have to be hardened properly, or else the looseness will return very shortly. Keep in mind that this was a very tightly machined hinge-joint when it was new, depending on perfect hinge mating surface fits for its tightness rather than the fit of the screw shank. While we can't easily restore the perfect fit of the hinge itself, we can surely repair the fit of its hinge pin, thereby tightening the barrel's fit with the frame, usually to a fair degree.



The Model No. 2 hammer in the ready to fire position. Notice the small "hump" at the front-top of the firing pin; this is the cam which engages the split spring to allow cylinder stop operation. From the Kent Moshier collection. Author photo.



A close-up of a tip-up with the barrel partially opened, showing the rear of the barrel, just below the bore is the "pocket" that the cylinder's axle pin rides in. Author photo.

The first step: Get that old screw out, but even this simple sounding task can sometimes offer real challenges; hence, this is where most of the unintended damage is usually done. The screw is nearly always frozen in place with 100+ years of hardened oil and accumulated oxidation. Assuming the screw still has something of a decent slot left, select a very-perfect fitting hollow-ground screwdriver. Never use a screwdriver that you bought at a hardware store or one that doesn't fit the screw slot perfectly. With the gun disassembled except for the barrel, fasten the grip frame in a padded vise.

Heat the area of the hinge with a small propane torch, playing the flame on the *bottom* of the hinge with the barrel open. When this area is hot enough so that a drop of water jumps off (about 250-350 degrees F; a small amount of heat that should not harm the finish), soak that warmed hinge with a good penetrating solvent. The solvents called *Chrysler Heat Riser Valve Penetrant* or even *Liquid Wrench* have both worked well for me and these are the most aggressive penetrating oils we have used, but you may have a favorite penetrating solvent of your own. When the solvent is applied to the heated area it will smoke like the dickens so you might just want to open a window beforehand.

After the gun has cooled to the touch, remove it from the padded vise and lay it on the workbench, screw slot side up, with the barrel closed and locked. Now try to turn the screw out with the driver, using *more downward pressure* than twisting effort. Keep the gun from moving with your other hand or better yet, have an assistant hold the gun from turning so you can use both hands on the driver, one to push down, the other to turn. Most stubborn screws will come out after the heat/oil treatment. If not, try the heat/oil trick several more times, often 3 or 4 applications will get solvent into the innermost areas around even the rustiest screw. A very useful contraption to have for times like these is a "screw vise" like the one sold by B-Square that accepts Brownell's magna-tip screwdriver bits. The screw vise takes the place of an assistant and holds the driver bit firmly in place at the same time so all you have to do is turn the bit with a quarter-inch, open-end wrench. Two important cautions: 1) use perfectly fitting driver bits, and 2) do not omit the heat and penetrating oil operation before using the screw vise, in fact the heat and oil trick should be performed with the screw vise in place.

If you have a screw that is completely missing its slot, as some are, especially when someone has tried this before, then you are in for some tedious, and thoughtful work if that screw is to be removed without damage to the frame or barrel. The barrel pivot screw, if it is an original part, will be quite hard. As a matter of course, you can usually count on it being harder than the metal in the frame around it, whether the frame is bronze or steel. A cute trick we have used with success in a great many cases has been to first carefully grind the exact center of the screw with a tiny carbide burr in the Dremel tool or Foredom hand-piece. This operation is not as difficult, nor is it as time consuming, as you might imagine if done with the gun clamped in a padded vise and under magnification with good light. Once you have a good center hole ground out that is deeper than the surrounding metal, a smaller carbide burr can be used to grind out a new screw slot, all the while using due care not to cut into the surrounding frame. Once you have created a new slot that is capable of holding a #3 or #4 thickness screwdriver bit, perform the heat and penetrating oil operation suggested above first, and then use a screw vise to remove the screw.

Alright, let's assume you have the worst case screw scenario: The screw head is gone altogether but it's shank is still in the barrel and threaded (frozen, of course) into the opposite side of the frame hinge. Don't panic, it can still be repaired and it need not be as awful as you think. Usually when this happens the screw shank has become thoroughly rusted to the barrel. We will use the same trick we did on the screw whose slot was torn out, only with an even smaller carbide burr we will grind a perfect center hole into the threaded end of

the screw, and then repeat the operation on the broken end of the screw.

The frame/barrel is then mounted firmly in your drill press vise, head-side of the screw facing up, with the center of screw exactly in line with the drill bit. A sharp center drill is used to first start a small dent on absolute center. Now use a drill bit (.106" diameter for Models No. 1 and 1 1/2 or a .138" diameter for the Model No. 2) to drill the screw shank out to exactly the depth of the barrel, plus approximately twenty thousandths of an inch. The barrel is now free to be removed from the frame. Leave the frame right where it is and select the correct size tap drill bit (use a number 42 drill bit for Models No. 1 and 1 1/2, use and a number 33 drill bit for the Model No. 2) to deepen the hole exactly to half the depth of the threaded portion of the frame hinge. Turn the frame over now and once again fasten it in the drill press vise only this time with the threaded side up and on exact center with the drill bit and finish drilling the hole with that same bit. The hole in the Model No.1 and No. 1 1/2 will be the correct size to be tapped with new, conventional #4-48 screw threads, in a Model No. 2 it will be the correct size for a conventional #6-40 screw thread. When you make your new hinge screw it will be sized according to the instructions below excepting it will have #4-48 threads in the smaller frame sizes, or #6-40 in the Model No. 2.

Once you have the old screw out, it will be necessary to carefully ream the left side frame hole, along with the barrel hole to a slightly larger size, keeping the threaded hole on the right side of the frame intact. Use a hand reamer for this purpose, you get away with as little as one or two thousandths oversize, but ream in one thousandth increments until the holes are round once again. Now you will make a new screw especially for this combination of standard thread and head size, but with an oversized shank to suit your newly reamed holes. Suitable screws may be made from drill rod, then hardened to 40-45 on the Rockwell C scale. The La Salle *Fatigue Proof* steel rod is an excellent alternative material and it may be used *as is*. Once you have your new screw perfectly fitted in the gun, it should be removed for heat treatment and finishing in nitre blue or plating.

Materials sources

La Salle steel rod or drill rod:

Brownell's Inc., 200 So. Front St., Montezuma, IA 50171.

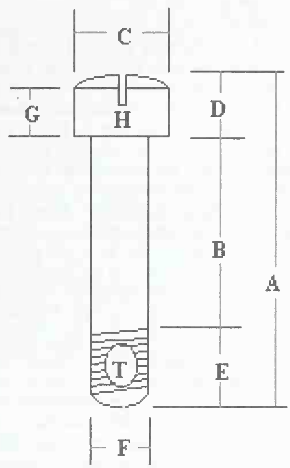
Decimal size hand reamers or drill rod:

MSC Industrial, 151 Sunnyside Blvd., Plainview, NY 11803-9915.

Chrysler Heat Riser Valve Penetrant: any Chrysler Corp. parts department.

Standard replacement hinge screw sizes for Smith & Wesson Tip-Up Models.

Sizes may vary slightly from gun to gun.



HINGE SCREW

Hinge Screw Dimensions For S&W Tip-Ups

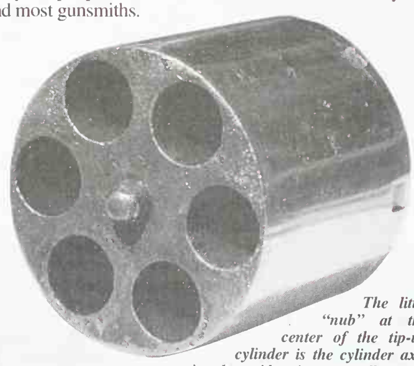
Model	A	B	C	D	E	F	G	H	Thread; T
No. 1	.505"	.270"	.158"	.070"	.164"	.103"	.056"	.030"	44 RH
No. 1 O.M.	.564"	.324"	.157"	.070"	.175"	.105"	.050"	.030"	44 RH
No. 1 N.M.	.550"	.372"	.171"	.070"	.165"	.105"	.055"	.030"	44 RH
No. 2	.642"	.372"	.198"	.070"	.200"	.133"	.055"	.030"	40 RH

Cylinder end-shake repairs.

You will nearly always find these tip-up models have excess cylinder end-shake, that is, front to rear movement. Since the cylinder needs to contact the rear of the barrel in order for it to have a forward axle point, this end-shake (lack of contact) will also allow the barrel to move up and down. Do you see that small-domed projection in the center/front of the cylinder? That is the axle pin, and it is designed to fit into that little "dimple," the small recess at the rear of the barrel just under the bore, when the barrel is closed; that is the cylinder's front axle point. Low and behold, the revolver has also been designed so that the cylinder pin is adjustable in order to take up this slack. In the No. 1 and No. 2 models, the rear of the axle pin has a screw slot, and that slot is accessible through the hole at the center of the ratchet at the cylinder's rear end. Most Number 1 revolvers use a variation on this theme: The axle pin is loosened from the front with a special spanner wrench, *after* its lock-screw has been loosened from the rear.

Following the same procedures I outlined to remove the barrel hinge screw: Heat the area, apply a penetrating solvent while its hot. You may have to repeat this procedure several times, and then be certain you use a perfectly fitting screwdriver bit. Once you have the pin rotating freely, the axle pin is adjusted by turning it. If you turn the pin clockwise, the pin will move forward, allowing more of itself to protrude from the front of the cylinder. Turn the cylinder pin screw forward until the barrel will just lock shut and stop with no extra effort. If you turn the axle pin out too far, it will simply prevent you from latching the barrel closed. When the axle pin can be removed so much the better, this gives us the opportunity to properly clean its threads and the threads in the cylinder before re-installing the pin screw with blue Loctite.

Following these little hints should enable you to dramatically affect the tightness of your Smith & Wesson Tip-Up's barrel and cylinder. When you have successfully removed all the excess play from the barrel and cylinder, it will almost always produce a large improvement in timing and cylinder lock-up as well. As you can see, it's actually a fairly simple process, within the realm of some hobbyists, and most gunsmiths.



The little "nub" at the center of the tip-up cylinder is the cylinder axle pin that rides in a small round "pocket" at the rear of the barrel. Six chambers tells you that this cylinder is from a .32 caliber Model No. 2 Army. Author photo.

Cylinder stops.

The cylinder stop. These guns used a unique and really sort of crazy arrangement to lock the cylinders. The cylinder stop is mounted partially outside the gun, on the top of the frame and is actuated by the hammer's top as the hammer is cocked. Underneath the cylinder stop is a funky little forked piece called a split spring. Pay attention to the top-front of that firing pin and you will notice that the rear of the top is flat, while the front is tapered toward the front. It worked like this: When the hammer is pulled back, the flat portion of the firing pin *tip's-top* pushes up on the split spring without separating it and that causes the cylinder stop to rise up and unlock the cylinder. When the hammer falls, the tapered front of the firing pin *tip's-top* separates the split spring, allowing the cylinder stop to remain in the down and locked position as the hammer passes through the split spring.

Early versions of the Model 1, called the 1st - 1st (for First Model - First Issue) were even stranger looking. They didn't use a split spring; instead they used a two piece hammer whose entire top was hinged so that it would pivot slightly under thumb pressure just as you began to cock the hammer. This odd arrangement, though different from the above, performed a similar function, in allowing cylinder stop operation and hammer return.

You will frequently encounter these guns with freely rotating cylinders, even though the cylinder stop spring seems to be applying tension to the cylinder stop. The cylinder stop notches on all these guns are not very deep and the bolt portion of the cylinder stop that protrudes down into the cylinder opening in the frame is not very long, so it doesn't take much to cause engagement to be lost altogether. Take notice to see if you can cause the stop to lock the cylinder by holding the stop down with a slight thumb pressure. If you can, check first to see if the screw that holds the striker is tight. If the striker screw is tight, remove the stop from the frame and look between the striker and the stop to see if the striker fits the stop's contour perfectly. If it doesn't fit perfectly, chances are pretty good that the stop has "snagged" on something, or the gun has been dropped and the stop is bent. You will want to carefully unbend the stop, which is usually quite soft, so it will once again match the contour of the spring-hard striker.

Finally, let's try not to overlook the obvious: is the gun rusty or internally very dirty? An awful lot of grime and/or rust can build up in tight spaces, especially after one hundred and twenty-five or more years of shooting and being carried in pockets as many of these were. Take a closer look and make sure that there isn't a build up of rust or simply old grease and grime up in between the striker and the stop that might be holding the striker down and the stop up; this can also prevent the stop's bolt from engaging the cylinder stop notches. Also, look closely at the recess or mortice in the frame where the cylinder stop fits; any build-up of rust or grime in this tight fitting area can easily prevent the stop from moving fully down into its mortise. The cylinder stop does not require a great deal of spring tension in order to hold it down properly, so the factory never used very strong springs to begin with. Conversely, you can understand how just a little dirt or rust in the wrong place, or even a slightly bent part could very easily prevent the cylinder stop from doing its job.

Smith & Wesson Tip-Up

Disassembly Instructions

1) **Initial disassembly and cylinder removal:** *Be certain you never point the muzzle of the revolver at yourself or at anyone else during this first portion of the disassembly procedure. Until you have the cylinder exposed and can make absolutely certain that the chambers are not loaded; keep the muzzle pointed in a safe direction.* Lift up on the barrel catch (#2), and tilt the revolver barrel all the way up to open the action and expose the cylinder. Pull the hammer (#16) to the rear just slightly; only enough to operate the cylinder stop so the cylinder will spin freely, then withdraw the cylinder straight out through the front of the frame opening. ***If any cartridges remain in the chambers, remove them now.***

2) **Barrel removal and disassembly:** Remove the barrel pivot screw (#5) from the left side of the hinge on the frame (#22), the barrel (#1) may now be withdrawn from the frame. On Model 1 3rd Issues, Model 1 and Model 2 the the ejector pin screw (#15) may be removed and the ejector pin (#14) may be withdrawn from the barrel. On Model 1 2nd Issue revolvers the ejector pin is fixed in place. Remove the barrel catch screw (#3) from the rear face of the barrel, the barrel catch (#2) and its spring (#4) may be removed from the bottom of the barrel note the relationship of the barrel catch to the barrel for reassembly.

3) **Grip and sideplate removal:** Remove the grip screw (#29) and the grips(#25). Remove the sideplate screw (#24). Turn the frame on its side holding it by its front end with the sideplate (#23) facing up over a padded surface. Strike the grip frame one or more quick, sharp blows using a plastic or wooden mallet, this will cause the sideplate (#23) to jump up out of its seat in the frame for removal. Never attempt to pry off the sideplate.

4) **Mainspring and action disassembly:** Use a pair of "spreader" pliers to compress the top of the mainspring (#21) so that the stirrup (#30) on the rear of the hammer may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the strain screw (#35), located in the bottom-front of the front grip strap on the frame, and withdraw the mainspring (#21), bottom first, from the frame side. Carefully rotate the top of the hand (#18) to the rear using a small screwdriver as a tool, and while holding the hand to the rear, pull the trigger (#32) and hold it to the rear. The hammer (#16) may now be rotated about one-half way back and then carefully pulled upwards, off of its hammer stud (#17) and out of the frame through the sideplate opening.

5) **Trigger removal:** Drift out the trigger pin (#33) with a suitable pin punch and the trigger (#32) along with its trigger spring (#34) may be removed out from the bottom-front of the trigger opening in the frame. The trigger spring (#34) is a press fit within the trigger (#32).

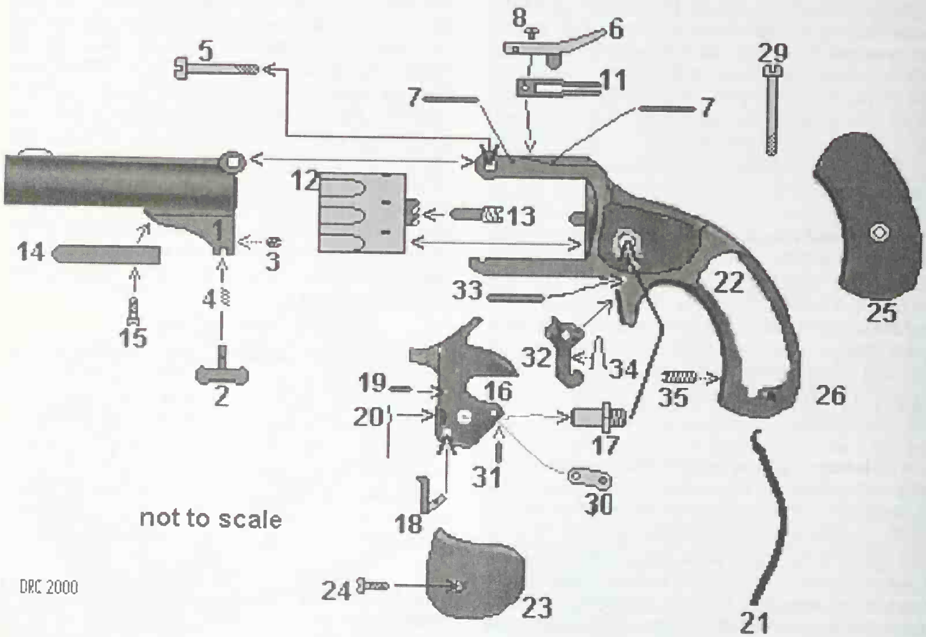
6) **Cylinder stop disassembly:** On Model 1 revolvers; drift out the cylinder stop pin (#7) front (this is the forward-most of the pins that pass through the frame's top-strap from side to side), and on Model 1 and Model 2 revolvers, also remove the rear-most pin which passes from side to side in the frame top-strap. Pull the cylinder stop (#6) as an assembly straight up and off the frame. The cylinder stop spring (#9) is wedged under the remaining frame pin (#10 cylinder stop spring pin) and the spring may be withdrawn by lifting it up and forward. The cylinder stop is disassembled by simply removing the cylinder stop screw (a.k.a. striker screw) (#8) from its top, this frees the cylinder stop striker (a.k.a. split spring) (#11) for removal.

7) **Hammer disassembly:** Rotate the hand (#18) about 180 degrees and pull it out of the left side of the hammer (#16). Drift out the handspring pin (#19) located at the center-front of the hammer which holds in the handspring (#20), the handspring now may be slid out of its recess in the front of the hammer. The stirrup (#30) may be removed by drifting out its pin (#31) at the rear of the hammer. NOTE the position of the stirrup (#30) for re-assembly.

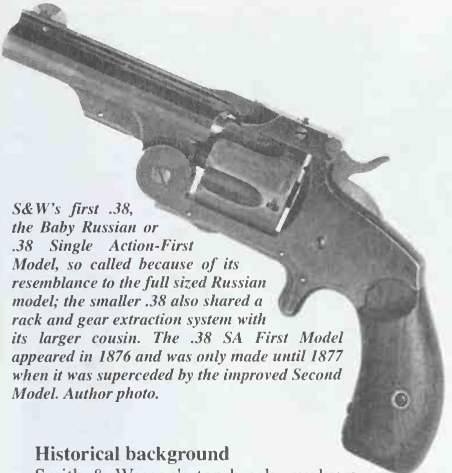
8) **Re-assemble** the revolver the in reverse order of above.

Parts For S&W Tip-Up Models Except Model One — 1st Issue and Model 1 1/2 Old Model

1t Barrel
2t Barrel catch
3t Barrel catch screw
4t Barrel catch spring
5t Barrel pivot screw
6t Cylinder stop
7t Cylinder stop pins
8t Cylinder stop screw
9t Cylinder stop spring (not shown)
10t Cylinder stop spring pin (not shown)
11t Striker
12t Cylinder
13t Cylinder pin
14t Ejector pin
15t Ejector pin screw
16t Hammer
17t Hammer stud
18t Hand
19t Handspring pin
20t Handspring
21t Mainspring
22t Frame
23t Sideplate
24t Plate screw
25t Grips
26t Grip pin
27t Grip escutcheon (not shown)
28t Grip escutcheon nut (not shown)
29t Grip screw
30t Stirrup
31t Stirrup pin
32t Trigger
33t Trigger pin
34t Trigger spring
35t Strain screw



Smith & Wesson's small- and medium-framed top-break revolvers in .32 and .38 caliber



S&W's first .38, the Baby Russian or .38 Single Action-First Model, so called because of its resemblance to the full sized Russian model; the smaller .38 also shared a rack and gear extraction system with its larger cousin. The .38 SA First Model appeared in 1876 and was only made until 1877 when it was superceded by the improved Second Model. Author photo.

Historical background

Smith & Wesson's top-break revolvers were extremely popular in the 19th and well into the 20th century both in America and abroad. During their period of production, over 1,620,000 small and medium framed top-break revolvers were manufactured by S&W. Sold in .32 S&W and .38 S&W calibers, these five-shot revolvers were built on two basic frame sizes: the small, or Model Number 1 in .32 S&W caliber and the medium size in .38 S&W caliber known as the Model Number 2. Both small and medium revolver sizes were manufactured over a long time span; from 1876 through 1940 and were produced in a broad range of single action, double action as well as safety hammerless configurations.

Like the larger Model Number 3 top-break revolvers, these were weapons whose barrels were mounted on a hinged, jointed frame and were designed so that when it was opened, the barrel was tilted down carrying the cylinder along with it for loading and unloading. With most of these, the barrels were fastened closed to the frames at the top by way of a "T" shaped barrel catch which is lifted up in order to open the barrel, however on some of the Safety Hammerless models you pushed down, or even sideways on a catch to open the barrel. All of the S&W top-break revolvers were quite advanced at the time of their introduction, featuring automatic, simultaneous extraction of the fired cartridge cases. As the top-break's barrel reached the fully open position a pawl was activated, allowing the coil spring-powered extractor to automatically retract itself back into the cylinder.

Revolvers built on the small and medium frame sizes:

.32 Single Action (small, Number 1 frame size)

These revolvers are single action only, their hammers are of the rebounding type and are equipped with a half-cock position. Very early production revolvers used a small eccentric cam to adjust mainspring tension while all later guns (the majority of production) used a more conventional threaded strain screw. Except for this early change in the method of adjusting the tension of the mainspring, the .32 single action remained mechanically the same throughout its entire production.

Manufactured 1878-1892, total manufactured: 97,574 (this model was serial numbered in its own series), finish: blue or nickel; caliber: .32 Smith & Wesson center-fire, 5 shot cylinder. Barrel lengths: 3", 3", 6", 8" and 10". Round butt; bird's head grip shape with black (most common) checkered hard rubber grips. Sights: Fixed, rounded front sight pinned in place in the barrel top rib, raised rear sight notch formed as part of the barrel catch.

.32 Double Action (small, Number 1 frame size)

These revolvers are designed to operate in both double action and single action and their hammers are equipped with half-cock, a.k.a. loading positions. As this design evolved, five separate models of .32 Double Action revolver were manufactured.

General information: Manufactured: 1880-1919, total manufactured: 327,641 (this model is numbered in its own serial range). Caliber: .32 Smith & Wesson, 5 shot cylinder; finish: blue or nickel. Grips: Checkered hard rubber, round butt shape with S&W monograms at the stock circles are standard and most common. Sights: Fixed, rounded front sight pinned in place in the barrel top rib (except 5th Model), raised rear sight notch formed as part of the barrel catch.

1st Model: manufactured 1880, serial numbers 1-30. Straight sided sideplate, rocker type cylinder stop, short flutes with double stop notches and

Top -Breaks

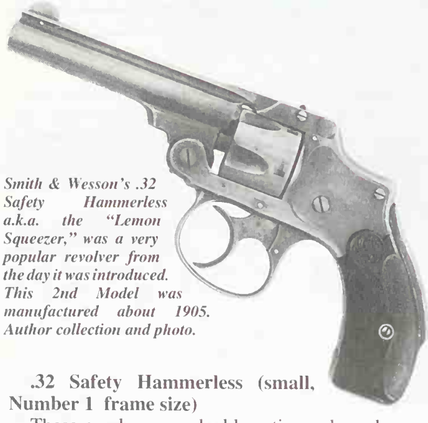
free cuts on cylinder, reverse curved trigger-guard bow, front sight pinned into barrel. 3" barrel only.

2nd Model: manufactured 1880-1882, serial numbers 31-22,172. Irregular sided sideplate, rocker type cylinder stop, short flutes with double stop notches and free cuts on cylinder, reverse curved trigger-guard bow, front sight pinned into barrel. 3" barrel only.

3rd Model: manufactured 1882-1883, serial numbers 22,173-43,405. Pivoting spring type cylinder stop, cylinder has conventional, longer flutes and only one set of stop notches, reverse curved trigger-guard bow, front sight pinned into barrel. 3", 3 " and 6" barrel lengths.

4th Model: manufactured 1883-1909, serial numbers 43,406-282,999*. Pivoting spring type cylinder stop, cylinder has conventional, longer flutes and only one set of stop notches, rounded trigger-guard bow, front sight pinned into barrel. 3", 3 ,"6", 8" and 10" barrel lengths. *Serial number data is an approximation; the exact transitional serial number from 4th to 5th Model is unknown.

5th Model: manufactured 1909-1919, serial numbers 283,000-327,641* Pivoting spring type cylinder stop, cylinder has conventional, longer flutes and only one set of stop notches, rounded trigger-guard bow, front sight forged as one piece with barrel. Smith & Wesson name and address only on barrel rib w/o patent markings. 3", 3" and 6" barrel lengths. *Serial number data is an approximation; the exact transitional serial number from 4th to 5th Model is unknown.

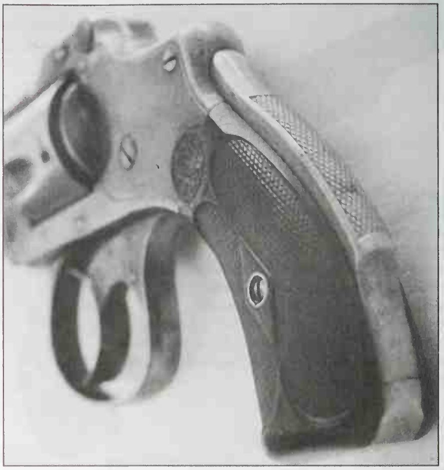


Smith & Wesson's .32 Safety Hammerless a.k.a. the "Lemon Squeezer," was a very popular revolver from the day it was introduced. This 2nd Model was manufactured about 1905. Author collection and photo.

.32 Safety Hammerless (small, Number 1 frame size)

These revolvers are double action only and are equipped with rebounding type hammers. Three separate models of the .32 Safety Hammerless design were made.

General information: Manufactured: 1888-1937. Total Manufactured: 242,981 (this model is numbered in its own serial range), caliber: .32 Smith & Wesson, 5-shot cylinder, finish: blue or nickel. Grips: Checkered hard rubber; round butt shape with S&W monograms at the stock circles are standard and most common. Sights: Fixed, rounded front sight pinned in place in the barrel top rib (except 3rd Model), raised rear sight notch formed as part of the frame (1st Model) or barrel catch on 2nd and 3rd Models.



In order to fire an S&W Safety Hammerless revolver, the shooter first had to squeeze the grip so that the safety lever (shown here at the rear of the grip) was pushed in, otherwise the trigger and hammer mechanism could not operate. Depressing the safety lever pivoted an internal steel safety bar and moved it out of the way of the hammer. Author photo.

1st Model: manufactured 1888-1902, serial numbers 1-91,417. Irregular shaped sideplate, rounded trigger-guard bow, front sight pinned into barrel. 2" (scarce), 3" and 3" barrel, barrel catch *PUSHES DOWN* to open barrel.

2nd Model: manufactured 1902-1909, serial numbers 91,418-about 170,000. Irregular shaped sideplate, rounded trigger-guard bow, front sight pinned into barrel. 2" (scarce), 3", 3" and 6" (scarce) barrel. T-Shaped barrel catch *LIFTS UP* to open barrel.

3rd Model: manufactured 1909-1937, serial numbers about 170,000-242,981. Irregular shaped sideplate, rounded trigger-guard bow, front sight forged integral with barrel rib. 2" (scarce), 3", and 3 "barrel lengths. T-shaped barrel catch *LIFTS UP* to open barrel.

.38 Single Action (medium, Number 2 frame size)

These revolvers are single action only, the hammers are equipped with a half-cock, a.k.a. loading position. In addition to the three separate models of the .38 Single Action that were produced, the .22 Single Shot, 1st and 2nd Model pistols were manufactured using the basic .38 Single Action frame size.

Identification notes: the .22 Single Shot 1st Model was built on the .38 Single Action 3rd Model revolver frame and some .22 S.S. 1st Model pistols exist which were supplied by the factory with accessory .38 revolver barrels and cylinders. Conversely, the .22 S.S. 2nd Model was built on a highly altered .38 Single Action 3rd Model frame on which the revolver parts would not work.

1st Model a.k.a.: Model No. 2 First Model, Baby Russian. Serial numbering: 1-25,548 (this model has its own serial number range), manufactured: 1876-1877, caliber: .38 S&W, finishes: Standard in blue or nickel. Grips: Round butt. Standard production; nickel guns with checkered black hard rubber with block letter S&W logo, blued guns furnished in plain walnut. Barrel Length: 3 " and 4". Sights: Fixed, rounded front sight pinned into barrel top-rib. Raised rear sight notch formed as part of the Barrel Catch.

Distinguishing Features of the .38 Single Action First Model: 1) Spur Trigger in sheath made as part of frame. 2) "LONG" extractor housing under barrel. 3) Geared extraction with SQUARE (4-sided) extractor shank.

2nd Model a.k.a.: New Model .38 No. 2 Single Action, .38 Single Action Model of 1880. Serial numbering: 1-108,255 (this model has its own serial number range), manufactured: 1877-1891, caliber: .38 S&W. Finishes: standard in blue or nickel. Grips: Round butt; checkered hard rubber with block letter S&W logo (early guns) or fancy S&W logo (later guns) on nickel guns, blue guns furnished in plain walnut. Barrel length: 3 ",4", 5", 6", 8" and 10". Sights: Fixed, rounded front sight pinned in place in the barrel top rib. Raised rear sight notch formed as part of the Barrel Catch.

Distinguishing Features of the .38 Single Action Second Model: 1) Spur Trigger in sheath made as part of frame. 2) "Short" extractor housing under barrel. 3) Hooked cam extraction with pentagon (5-sided) extractor shank.

3rd Model a.k.a.: Model No. 2 Third Model, Model of 1891. Serial numbering: 1-28,107 (this model has its own serial number range), manufactured: 1891-1911, caliber: .38 S&W, finishes: standard in blue or nickel. Grips: Round butt; checkered hard rubber with fancy S&W logo. Barrel Length: 3 ",4", 5", and 6". Sights: fixed, rounded front sight pinned in place in the barrel top rib. Raised rear sight notch formed as part of the Barrel Catch. Optional target sights were available as a Paine or post front blade pinned into the barrel rib and a rear adjustable for windage and elevation mounted within the barrel catch.

Distinguishing Features of the .38 Single Action Third Model: 1) Conventional Trigger and *removable* trigger guard. 2) "Short" extractor housing under barrel. 3) Conventional extraction with pentagon extractor shank. 4) Rebounding Hammer with oversized, checkered spur. 5) Barrel top rib marked - Model of '91.

.38 Double Action (medium, Number 2 frame size)

These revolvers are designed to operate in both double action and single action, their hammers are equipped with half-cock, a.k.a. loading positions. Five different .38 Double Action models were manufactured during its production.

General Information: Manufactured: 1880-1911, total manufactured: 554,077 (this model is numbered in its own serial range), caliber: .38 Smith & Wesson, 5-shot cylinder, finish: blue or nickel. Grips: Checkered hard rubber, round butt shape with S&W monograms at the stock circles are standard and most common. Sights: Fixed, rounded front sight pinned in place in the barrel top rib (except 5th Model), raised rear sight notch formed as part of the barrel catch.

1st Model: manufactured 1880, serial numbers 1-about 4000*. Straight-sided sideplate, rocker-type cylinder stop, short flutes with double-stop notches and free cuts on cylinder, reverse curved trigger-guard bow, front sight pinned into barrel. 3 "and 4" barrels. *Ending serial number data is an approximation; the exact transitional serial number from 1st to 2nd Model is unknown.

2nd Model: manufactured 1880-1884, serial numbers about 4001-119,000*. Irregular-sided sideplate, rocker-type cylinder stop, short flutes with double-stop notches and free cuts on cylinder, reverse curved trigger-guard bow, front sight pinned into barrel, hammer fly added. 3 ",4", 5" and 6" barrels.*Beginning serial number data is an approximation; the exact transitional serial number from 1st to 2nd Model is unknown.

3rd Model: manufactured 1884-1895, serial numbers 119,001-322,700. Pivoting spring type cylinder stop, cylinder has conventional, longer flutes and only one set of stop notches, reverse curved trigger-guard bow, front sight pinned into barrel. 3", 4", 5", 6", 8" and 10" barrel lengths.

4th Model: manufactured 1895-1909, serial numbers 322,701-539,000. Pivoting spring-type cylinder stop, cylinder has conventional, longer flutes and only one set of stop notches, reverse curved trigger-guard bow, front sight pinned into barrel. 3", 3 " 6", 8" and 10" barrel lengths.

5th Model: manufactured 1909-1911, serial numbers 539,001-554,077. Pivoting spring-type cylinder stop, cylinder has conventional, longer flutes and only one set of stop notches, reverse curved trigger-guard bow, front sight forged as one piece with barrel. Smith & Wesson name and address only on barrel rib without patent markings. 3", 3 " and 6" barrel lengths.

.38 Safety Hammerless (medium, Number 2 frame size)

These revolvers are double action only and are equipped with rebounding type hammers. The .38 Safety Hammerless was produced in five individual variations or models.

The breech face of a Smith & Wesson Safety Hammerless. All of S&W's hammerless revolvers used floating firing pins and were equipped with rebounding, internal hammers. Author photo.

General information: Manufactured: 1887-1940, total manufactured: 261,493 (this model is numbered in its own serial range), caliber: .38 Smith & Wesson, 5-shot cylinder, finish: blue or nickel, stocks: Checkered hard rubber, round butt shape with S&W monograms at the stock circles are standard and most common. Ivory and pearl stocks were optional throughout production, on later models these latter were sometimes provided with gold S&W medallions at the stock circles. Sights: Fixed, rounded front sight, pinned in place in the barrel top rib (except 5th Model), raised rear sight notch formed as part of the frame (1st through 3rd Models) or the barrel catch on 4th and 5th Models.

1st Model: manufactured 1887, serial numbers 1-5,250 (approx.). Irregular-shaped sideplate, rounded trigger-guard bow, front sight pinned into barrel. 3 ",4", 5" and 6" barrel lengths, barrel catch *PUSHES SIDEWAYS* to open barrel.

2nd Model: manufactured 1887-1890, serial numbers 5,000 approx. - about 42,483. Irregular-shaped sideplate, rounded trigger-guard bow, front sight pinned into barrel. 3 ", 4", and 5" barrel lengths, barrel catch *PUSHES DOWN* to open barrel.

3rd Model: manufactured 1890-1898, serial numbers about 42,484-116,002. Irregular-shaped sideplate, rounded trigger-guard bow, front sight pinned into barrel rib. 3 ",4", 5" and 6" barrel lengths, barrel catch *PUSHES DOWN* open barrel.

4th Model: manufactured 1898-1907, serial numbers 116,002 to about 220,000. Irregular-shaped sideplate, rounded trigger-guard bow, front sight pinned into barrel rib. 3 ",4", 5" and 6" barrel lengths, barrel catch *LIFTS UP* to open barrel.

5th Model: manufactured 1907-1940, serial numbers about 220,000 to 261,493. Irregular-shaped sideplate, rounded trigger-guard bow, front sight forged as integral part of barrel rib. 2", 3 ",4", 5" and 6" barrel lengths, barrel catch *LIFTS UP* to open barrel.

Safety cautions, unique problems

From reading the above dates of manufacture, you will see that the majority of the production of small- and medium-size Smith & Wesson top-break revolvers were manufactured before the era of smokeless powder, therefor we advise the use of strong caution when selecting the kind of ammunition you will fire in these guns. As a good, but generalized rule of thumb; only mechanically sound *.32 Double Action 5th Models*, the *.32 Safety Hammerless 2nd* and *3rd Models*, *.38 Double Action 5th Models* and *.38 Safety Hammerless 5th Models* should be considered as candidates for potential use with modern, smokeless powder ammunition. All of the other models in all these series listed above, as well as all .32 and .38 Single Action revolvers, should be considered for *black powder cartridge use only*, and then only if the individual revolver has been determined to be in safe operating condition. These strong cautions are expressed here only because the author has observed so many otherwise very fine black powder-era firearms of this kind that have been ruined by people using smokeless powder ammunition in them. Normally these modern, factory smokeless loads will not explode the revolver cylinders but what does occur, as we describe below, nevertheless has the potential to eventually wreck the gun for good.

There are certain kinds of problems that are unique to this sort of revolver, problems which are caused for the most part by user abuse of one kind or another regardless of caliber, action type or frame size. As a for instance, and mentioned just above, we will encounter many of these black powder-era small and medium top-break revolvers that show signs of having been fired with, and damaged by smokeless powder ammunition. Some of the more common tell-tale signs of this will be; a large barrel to cylinder gap, excessive cylinder endshake and too much headspace. Another indication can also be a barrel that no longer locks up tightly with the frame. When a top-break S&W is exhibiting any or all of the above mechanical flaws, they are probably indications that the frame and barrel *as a unit* have been stretched out as the direct result of having been fired with smokeless powder ammunition. What will usually happen when a frame stretches is the cylinder opening (note; with this design the cylinder opening is formed by the frame/barrel assembly) has become longer than it is supposed to be, thus it is no longer capable of properly supporting the cylinder at either end. Now that it

has been left largely to its own devises, the cylinder doesn't know what to do.

To some degree frame stretching is considered a normal occurrence, even in modern revolvers, most of which will develop excess headspace, cylinder end-shake and barrel-to-cylinder gaps after being fired considerably with factory ammunition. The condition I am describing will occur at a much faster rate if hot (over-pressure), hand-loaded ammunition has been used. Normal corrections for this frame stretching in the side-swing or in a solid-frame revolver would be to first repair the cylinder end-shake, and correct the head-space; at that point the barrel is actually set backwards into the frame one turn by cutting the thread shoulder back, this allows the barrel to screw into the frame farther, then the barrel-cylinder gap may be re-adjusted. It will be patently obvious to you once you have looked over how the top-break design works that we cannot set the barrel back with this sort of a revolver because our barrel is set at a fixed location, so if the frame-barrel unit is already stretched, you really are stuck with it.

In a situation unique to this revolver design, some of the related problems that are caused by frame stretching can be corrected, but only at the sacrifice of some others which the gun owner will have to learn to live with. As an example, an excess of cylinder end-shake tells us that the cylinder, along with the extractor is being allowed to move forward, away from the standing breech part of the frame; this also creates a condition called *excess headspace* (in greatly oversimplified terms: where the cartridge is moved too far away from the firing pin), and this situation very quickly leads into misfires and unreliable primer ignition. On top of that, the fact that the cylinder has moved forward means that it has moved the extractor ratchet teeth forward with it, taking them farther away from their having full contact with the hand; this is very often the prime source for many cylinder indexing problems. Headspace and most of the cylinder end-shake can usually be corrected by shimming the cylinder so it is mechanically held back to the rear. Making this type of repair will give you back the desired reliable ignition and can help immeasurably to bring about correct cylinder timing and indexing, but a sacrifice comes in the bargain; fixing this part of the gun (the important part!) so it can function properly will probably leave the revolver with a larger than normal barrel-to-cylinder gap.

Troubleshooting the small- and medium-framed top-breaks

Here we are dealing with three distinctly different action types; all are top-breaks and so are similar in that respect but all differing at least somewhat from one another. During these troubleshooting procedures we will take pauses to break off into the various little specialty areas which address specific problems that are associated with the different action types where it is necessary to do so. From the previous paragraphs it will be clear that we think it is important for the gunsmith to pay special attention to looseness in the frame/barrel/cylinder areas of these top-break revolvers. Unlike some of the less expensive top-break revolvers of their day, when these top-break S&Ws are in perfect order they will lock up just like their big brothers, the .44 and .45 caliber Models Number 3 did: and that is *rock solid*. Smith & Wesson, this old-line Springfield, Massachusetts, company, designed and built the actions on these revolvers to work as fine tuned machines and brother, they are slick as grease when they are working right. However, if we are seeing looseness in any finely tuned machine its usually a sign of hard use and abuse, in the Smith & Wesson top-breaks this apparent looseness should be the gunsmith's first indication that he needs to pay attention, because something is not right. Listed below are a some areas which are unique to S&W top-break revolvers that you might want to give some attention to.

After making absolutely certain that all the chambers in the revolver's cylinder are empty, begin your trouble-shooting procedure with the barrel closed and locked, holding the gun in two hands by the barrel and by the grip. Let's try out how well the barrel is fitted to the frame by applying some pressure; just as you would if you were going to try to break open the barrel but without operating the barrel catch, we want to see if there is any apparent movement at the junction of the frame and barrel, just where the barrel catch locks the barrel closed. It is alright if you see a small, and I mean small, amount of movement, this would be considered normal for any gun that has seen some use. Honestly, we would be surprised if we saw a well used old top-break revolver without at least a tiny amount of movement at that junction point. On the other hand, any larger amounts of barrel looseness at this juncture can be a sign of too-long use with smokeless powder ammunition or possibly even of a bent frame from some other form of abuse. Frames were sometimes bent by the actions of a careless shooter, flailing and flipping the barrel closed with the destructive flourish of one-hand. At other times these guns were used as nail-hammers or to drive wire staples into fenceposts, just as I suppose a lot of older Colts and other revolvers seem to have been.

The important part about this is that it doesn't really matter whether the looseness has been caused by owner abuse or by the wrong ammunition, the bottom-line is when the barrel lock-up in the top-break revolver seems to be terribly loose, you will also find out that this gun has a bunch of other, sometimes serious operational problems. Likely, it will have problems in these areas; excessive headspace, an overly large barrel to cylinder gap, poor timing and loose cylinder lock-up (the latter is because the cylinder stop cannot lock the cylinder normally since the cylinder itself is moving up away from the cylinder stop along with that loose barrel), low firing pin strikes, and a whole little raft of other trouble.

As we touched on earlier, long use with smokeless powder ammunition, or sometimes even from just a few overly-heavy hand loads may have caused the frame and the barrel's top-strap to be stretched lengthwise. Some of the symptoms of this stretching can be repaired, to a point, but sometimes they can't. From the onset of your examination, be wary of the revolver that is very loose in those areas we just mentioned, or of one that shows a large "barrel-to-cylinder" gap; no matter how nice it seems to be otherwise, these are usually indicators that there is real trouble. Measure the revolver's barrel-to-cylinder gap by sliding automotive feeler gauges in the junction between the two parts. With a tight gun the barrel-to-cylinder gap should be from roughly .005 to .008" (this means; the space or gap between the barrel and the cylinder should be five to eight thousandths of an inch wide), any gap that is appreciably larger than this is likely a sign of further trouble. We've seen some badly abused top-break revolvers with barrel-to-cylinder gaps that were a tenth of an inch wide and even more, these revolvers unfortunately have been abused beyond any sensible limits of safe repair. Whenever possible, try to pass on revolvers like this, they are about all through functioning and should be relegated to the category of for *display use only.*

Check those base pins: The base pin is the axle shaft the cylinder is rotating on. Its that large, hollow steel shaft that (you see when you remove the cylinder) is screwed into the back of the barrel, slightly below the bore. With the barrel open, try "wobbling" the cylinder with a side to side motion, and then the same but up and down. The cylinder should have little, if any visible movement. If you notice that you can wobble the cylinder more than you think is normal, this is probably indicating that the base pin and/or the cylinder axis are worn severely. The best tack (least expensive and labor intensive) would be to try and purchase a new replacement base pin from a gun parts supply house such as Gun Parts Corp., or from Jack First Inc. The base pin is screwed into the rear of the barrel. Failing that, the entire barrel assembly might be replaced, believe it or not, these sometimes show up for sale in either new or very nice condition, and the same can be said for cylinders.

Single action revolvers, cylinder stop tests.

Single actions in both .32 and .38 caliber use trigger actuated cylinder stops. Here we will check to see if the cylinder is being locked fully by the cylinder stop. While the gun is closed and with the hammer all the way down, you may check the cylinder for rotational play (radial play). Later, make the same test but with the hammer drawn all the way back and cocked. Your cylinder should have almost no discernable rotational movement. An exception to this rule will be found in some .32 single actions whose hammers were designed to rebound; some hammers will rebound all the way back to the safe position and while in this position, the cylinder is free to rotate. To check the .32 single action cylinder for rotational play; remove the hammer from the safety position and hold the trigger to the rear.

When a cylinder does show a lot of rotational movement it may be an indication of other problems. With the hammer still all the way forward, try pulling the trigger to the rear (just as with the .32 single action above) to see if this reduces the amount of radial movement in the cylinder. Should the amount of cylinder rotational movement be reduced while the trigger is being held back, you have an indication that the trigger's sear-tip could be broken, or that the hammer may have broken or altered notches. In either case, because of some mechanical flaw or damage, the trigger is being allowed to move farther forward than is normal. As the trigger moves forward it is forcing the cylinder stop to be pulled down and so out of full contact with stop notches in the cylinder. If the amount of cylinder radial play remained constant while the trigger was held to the rear, the revolver could just have a worn cylinder stop or it may have worn stop notches in the cylinder. Have a look also at those cylinder stop notches that are machined into the cylinder; should they measure wider near their tops but are narrower in the bottom, the notches are pretty well worn out and you may be better off by outright replacing the cylinder to remove that radial play. The frame's window, is the opening through which the cylinder stop moves up and down, could also be worn on the sides allowing the cylinder stop to shake from side-to-side; that will also show up as rotational movement in the cylinder.

For the next test, pull the hammer rearward; back into the half-cock position. With the hammer sitting on half cock the cylinder should be able to rotate freely by hand. You shouldn't *ever hear* an audible "click-click-click" like you would with a Colt single action. Lift the barrel catch up; doing so should unlock the barrel to be opened fully. Once again close the barrel and pull ever so *lightly* on the trigger; the trigger should be caught firmly with in the half-cock notch of the hammer and it should not go easily to the rear. Do not pull the trigger very hard; trying to force the issue here could easily break off that fragile trigger sear. If the trigger did not hold the hammer at the half-cock position, you probably have a gun with a broken trigger sear tip, and likely, a broken hammer notch (or notches) as well. If you heard that "click-click-click" that I mentioned earlier when the cylinder was being rotated while the hammer was at half-cock, then something is wrong. What? Either the hand has been damaged or altered, possibly it is an Italian replacement hand that is too-long, or the hammer may have been played with so much that the hand is *positioned too high* within its window. The condition certainly bears a closer look.

Double action cylinder stop tests and woes:

The tests: The cylinder should be locked and unable to be rotated by hand both when the hammer is all the

way forward, and when it is all the way backward at the fully cocked position. When the hammer is placed in the half-cock position, the cylinder should be able to be rotated by hand.

The woes: It's not hard to see after examining them, why the cylinder stop on the 3rd through the 5th model double actions in both calibers is the most commonly broken part in these guns. These cylinder stops were machined from one piece of steel and then hardened into a spring so that the long, thin tapered "leaf" of the stop actually forms its own integral return spring. Ingenious, but ever so delicate. Attempts at repairing these have not ever met with success, so if you have a broken stop, your best bet is to replace it. To the author's knowledge, there are no modern-made replacement cylinder stops and for all the years I have been involved with collecting, original cylinder stops have always been very scarce. So the next idea is; why can't we make one? You (*not we*) can, if you are prepared for the long and arduous process which you are about to undertake. In a nutshell, it takes more work to make one of these and get it working than most of these guns are worth. Solutions? I haven't any great ones but here are two possible options; a) try and find a fifty dollar *clunker* at a gun show that has a working original cylinder stop, or b) get yourself a copy of J. B. Wood's vintage book titled "Gunsmithing: Tricks of the Trade" (DBI Books, 1982). Mr. Wood has included a cute little trick where he is able to produce a "fair" cylinder stop pretty quickly; using nothing more than a lady's "bobby pin."

First and Second Models in both .32 and .38 caliber used a completely different sort of cylinder stop called a "rocker stop" that is mounted within the trigger and is pivoted on the trigger pin. This odd, yet very dependable arrangement is also what necessitated the unusual looking cylinder with its two sets of cylinder stop notches and extra machined *leads* that were used in these, as well as the larger .44 Double Action models. There isn't much that ever goes wrong with this type of cylinder stop, so when you find one that isn't functioning, more likely than not you will find that the little spring and plunger which power the stop have become *gunked* up with hardened oil and grease or else they are rusted in place within the trigger.

Double action at half-cock:

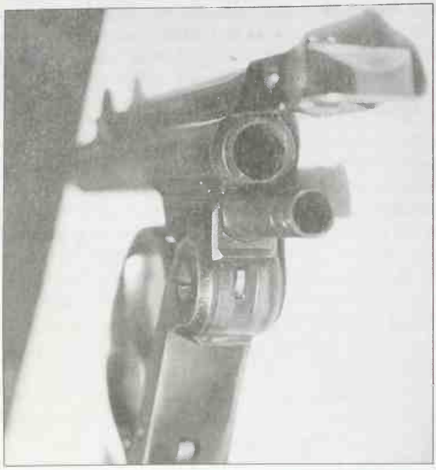
Draw the hammer to the rear a bit, back just far enough that it sets in the half-cock position. You may also attain this position by lightly pulling the trigger, which also ought to set the hammer into half-cock. While at half-cock, the hammer should be mechanically held back far enough so that the firing pin tip has been drawn back slightly into the frame, well away from the point where it could contact a primer if the revolver were loaded. Now try to push the hammer forward by pressing on the back of its spur with thumb pressure, the hammer should hold at the half-cock position without *falling off,* even under strong pressure. If there seems to be no half-cock or if there is a half-cock but it will not hold the hammer: This is telling you that the rear sear (the single action sear) and most likely, the hammer notch are both broken, damaged or have been "played with" by some amateur tinkerer.

Double or single action, full cock:

Next step in this test procedure: Bring that hammer back to the full-cock position. Paying close attention to *exactly where it is during the hammer's travel* that the hammer and trigger actually mate and lock in full-cock. In the ideal, your trigger's sear-tip should be dropping into the hammer's full-cock notch completely at exactly the same instant as the cylinder was locked into battery (into index) by the risen cylinder stop. Also, all of this should have happened at the point when the hammer was a hair's breadth from being as far back as it could physically travel within it's cutout in the lock frame. ("hair's breadth" is one of those inferred, indefinite measurements, it means about, maybe one thirty-second of an inch, but *not* an eighth or a quarter of an inch.) If the hammer reached full-cock much before this point, it is just about a sure thing that the hammer has a broken cocking notch, the trigger's sear-tip is broken, or both the above.

What will happen when the hammer reaches full-cock before the cylinder has been pushed into index (index: cylinder chamber locked into position with the barrel bore — ready to fire) by the hand is; the cylinder chamber that is supposed to be under the hammer has not yet been rotated around far enough to be aligned with the barrel. That cylinder has not been locked into battery yet by the cylinder stop, it is loose and free to rotate so here you have a potentially dangerous situation and one that no gunsmith, no matter if they are amateur or professional, should ignore. I have had a few people tell me they have a gun that does this but after cocking the hammer, they simply roll the cylinder into battery with their fingers. Now class, who can tell us what is probably going to happen on that one occasion when they forget about rotating the cylinder into battery manually?

Does it hold? When the hammer has been cocked it should not be able to fall forward unless the trigger has been pulled first, so now that you have already set the hammer at its fully cocked position, lets test it to see if it will hold there at full-cock as is should. Without touching the trigger, use your thumb to press on the back side of the hammer spur in an attempt to push the hammer forward. Your gun's hammer should stay cocked, no matter how much pressure you apply with your thumb. If the hammer *falls off* at any point, then the full-cock in this gun is not safe and there is a high probability that the full-cock notch of the hammer and/or possibly to the rear sear (double action guns) or the trigger's sear tip (single action guns) is damaged or broken.



If your revolver is out of time, be sure you remove the cylinder and check the back end of the barrel around the forcing cone for cracks. Notice how thin the bottom of the barrel is where the base pin is screwed into it. Author photo.

Look over that barrel and cylinder. If you are holding a top-break revolver that has the problem described above, open the barrel and remove the cylinder. Take the time to carefully examine the back of the barrel at the bottom of the forcing cone; just above where the base pin is threaded in, in order to make certain that the barrel is not cracked there. While there, you should also look over the front face of the cylinder for cracks, paying special attention just around the center near the gas ring. These two areas are where damage will occur first when a gun has been fired with the cylinder out of time, like the one described above. Sometimes the same damages are found when hot hand-loaded ammunition made with smokeless powder have been used. As long as you are inspecting the barrel for damages, use a good "white" bore light to check the inside of the barrel very closely and look for bulges. If you see a suspicious area, try pulling a tight fitting cloth patch on a cleaning rod through the bore just to see if you can *feel* any loose spots, this makes a quick and effective test for a bulged barrel.

Some repair procedures:

Many of the repairs here will be applicable to double, single or safety hammerless action revolvers except where we have specifically noted otherwise. These light to medium difficulty level repair procedures are presented as nearly as possible to being in the order they should be accomplished. What I mean by that is, you wouldn't want to go through all the trouble to try and repair the cylinder headspace, timing and end-shake before you had repaired the loose barrel lock-up. Hey, if you had repaired that barrel lock-up first, you might very well have already corrected some of the end-shake, headspace and timing problems.

Tightening the barrel lock-up

Now a relatively easy and permanent repair for revolvers that show play in the barrel catch area. It's a fairly straightforward fix that will often remedy quite a lot of barrel looseness; if that looseness is occurring right at the barrel catch. This specific operation is applicable to all the small and medium framed revolvers with a "T" shaped barrel catch that lifts up, only the earlier production safety hammerless models in both calibers use different types of barrel latching mechanisms. Referring to the takedown instructions that apply to your revolver, first remove the cylinder, and then reclose the barrel. With the revolver still closed, grasp the gun firmly by the barrel top strap and hold the barrel catch forward as hard as you can with the thumb of the same hand, while with your other hand try and move the frame up and down and look to see whether the "play" you noted before has either lessened or gone away. If the play has either decreased or disappeared while you have that barrel catch pushed hard-forward, then it's a fairly sure thing that most of that barrel play is being caused by a worn barrel catch screw.

This will be a fairly easy repair, all it involves is your removing the old barrel catch screw and then manufacturing a new screw with a slightly oversized shank area, one that will fit the screw hole in the barrel catch more closely than the worn-original screw. With some really worn guns the screw hole through the barrel catch may have become worn to an oval shape. Even though these barrel catches were fairly hard steel, the barrel catch screw forms the axle or pivot for the catch so that it and the barrel catch hole will have endured a lot of abuse simply by performing their normal, intended functions. In those guns you will have to ream the hole in the barrel catch to a slight oversize, not much larger than the original; only large enough so that the hole is round once again and not any more. You will also have to ream the corresponding portion of the hole through the left side of the barrel's top-strap to a corresponding oversize, so that the new screw shank which you also have made oversized, will pass through it. In many cases this little repair will remove most, if not all of the play in the barrel catch area all by itself. Now that you have that new screw fitted, do not forget that this is a critical part of the revolver's locking mechanism and that the screw must be hardened properly as covered in the section on making screws.

Headspace, cylinder end-shake repairs and the extractor stud

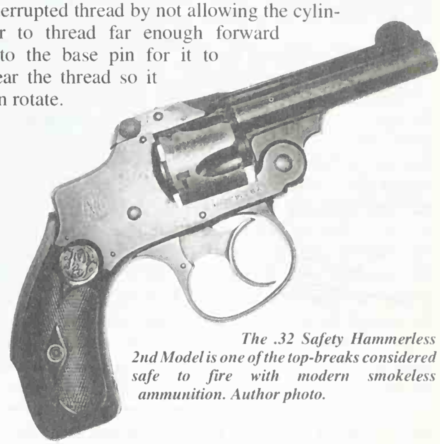
These are all areas we talked about earlier, on the problems of excess headspace along with too much cylinder end-shake. What is happening is, for several pos-

sible reasons the cylinder has developed too much end-to-end movement (back and forth play) which we term end-shake. In a revolver that has this condition the cylinder is being allowed to move farther forward than it should and in the S&W top-break revolvers we have three situations occurring:

Number One) The rear face of the cylinder has moved farther forward (in relation to the face of the standing breech) than normal. In other words; the gap or space between the rear of the cylinder and the front of the breech face has been enlarged. This gap or space is known as headspace and when it is larger than a fixed limit, we say that the gun has excess headspace. With the low pressure cartridges that we are dealing with here, an increase in headspace probably won't create any safety problems, but it does move the cartridge's primer farther away from the firing pin; and that will lead to misfires and overall unreliable ignition. *Number Two*) Since the extractor's ratchet teeth have been moved too far forward along with the cylinder, the ratchet teeth have been *moved away from their correct relationship with the hand*, this condition creates cylinder timing and indexing problems. And *Number Three*) As the cylinder and the extractor have been allowed to move farther forward than they should be, so then is the extractor stud. The extractor stud is a part that is threaded into the center-rear of the extractor and it acts as the rear axle for the cylinder, seating into a socket at the front of the standing breech when the barrel is closed. Once the extractor stud has been allowed to move forward along with our cylinder, the *rear cylinder axle has lost its seat with the frame*, this creates a condition that may well be allowing undesired side-to-side movement at the rear of the cylinder, movement which probably would not be there at all if that extractor stud were able to seat in its socket.

Likewise, we spoke previously about the unique design of the top-break revolver, and of how when the conditions of excess end-shake and headspace are corrected, we will be stuck with whatever large barrel to cylinder gap exists. There is no good way to repair this barrel to cylinder gap since these top-break barrels are not threaded into a solid frame like they are with other types of revolvers. You *could* repair the end-shake and the barrel to cylinder gap by machining a new extractor stud with a longer pilot that would shove the cylinder forward and hold it there. That would eliminate the excess barrel to cylinder gap but doing that would present us with the even bigger problems of excess headspace, poor cylinder timing and the unreliable ignition that will come with the cylinder being too far forward within the frame.

The most sound method of compromise with these is always to err on the side of moving the cylinder toward the breech and *decrease the headspace*. Shoving the cylinder toward the rear eliminates or at least reduces headspace and increases ignition reliability. And, by placing the extractor ratchet teeth back into the correct relationship with the hand you will improve the timing and indexing, and at the same time you are reestablishing the axle pivot point for the rear of the cylinder. That said, using the drawing in the illustration as your guideline, you can make (or have made) hardened steel shims from ten-thousandths of an inch (.010") thick shim stock that will fit onto the rear end of the base pin. The shims are used to shove the cylinder permanently toward the rear of the gun. Because of the tight spaces involved in there, and the fact that all of the small and medium top-breaks except the .38 Single Action 1st Model use a large interrupted thread at the rear end of the base pin which the cylinder screws onto, we are forced to use a maximum of about twenty-five thousandths-of-an-inch of shim set. Using a thicker shim set than this will sometimes begin to interfere with the interrupted thread by not allowing the cylinder to thread far enough forward onto the base pin for it to clear the thread so it can rotate.



The .32 Safety Hammerless 2nd Model is one of the top-breaks considered safe to fire with modern smokeless ammunition. Author photo.

Insert only enough shims to bring the headspace measurement down to about .066" - .068". Should you have to trim just a bit from the rear of the base pin during this process to get the adjustment just right, we recommend using a fine cut mill file, along with a small machinists square to aid you in keeping the rear face of the base pin at 90-degrees to its sides. Once you have the cylinder pushed rearward so that the headspace measurement has reached the optimum point, if the cylinder *still wants to move farther* to the rear, and doing this would decrease the headspace so that there would no be room left for the cartridge rims and so the cylinder would not be able rotate: stop here. At this juncture we need to remove the extractor stud from the rear of the extractor and then manufacture a new part, identical to the original, but with a longer pilot stud which will later be trimmed to the correct length to hold the headspace distance at the desired place with little or no front-to-rear movement. The extractor stud removal tool, like the one shown in the illustration may be scratch-built in the lathe. *Before attempting to remove*

the extractor stud, thoughtfully grasp the extractor by its shank, across the pentagonal flats in a small, hardwood jawed vise, being extra cautious not to over-tighten the vise jaws so you don't collapse the extractor shank. Next, heat the end of the extractor; that area around the extractor stud, with a propane torch just to the point where the old oil and grease that is trapped inside it begins to smoke and to "bubble out" around the outer edges of the stud. While the extractor is still quite hot, attempt to turn the extractor stud out by placing the above tool into its spanner cuts, be sure that you apply at least as much, if not more down-ward pressure as you do turning force. Should the extractor stud still be stuck in place and won't remove without the potential of damaging the extractor, leave the stud where it is and instead, try the *other repair method* we have shown in the accompanying illustration.

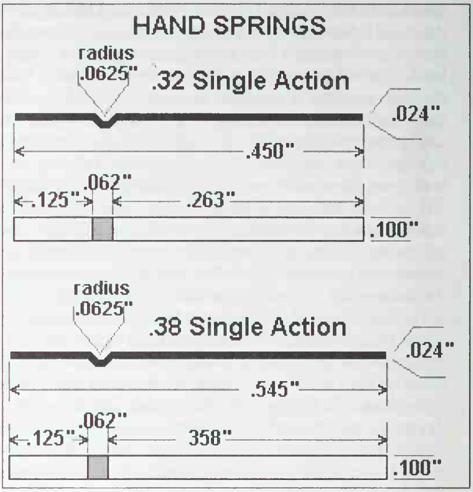
Quick timing hand repair:

Timing, carry-up, over-carry, under-carry.

Timing means that the cylinder should be rotated by the hand as the cylinder stop releases the cylinder and then rotated around far enough to be locked into position at the next chamber in line by the cylinder stop before the hammer is allowed to fall. Carry-up refers to the hand *carrying the cylinder up* to the next at battery position. Over-carry means the hand has carried the cylinder too far, past the point where it would be locked by the cylinder stop. Under-carry or failure to carry-up means the hand has not *carried*, or rotated the cylinder far enough for it to be locked by the cylinder stop.

If you have already corrected any other looseness, especially of the kinds outlined previously in this chapter and your gun is showing signs of failure to carry-up (under-carry), perhaps if the hand were given a bit more width it might just finish the carry-up process. Take the time to read the bit in Chapter 4 regarding how *ratchets and hands* operate and you will see that since this is a single stage ratchet system it is the *side of the hand* at its top that pushes on the side of the extractor tooth to finish the cylinder's rotation (carry-up.) The hand's top portion is active at the beginning of cylinder rotation and it stays active for most of the rotation cycle, however final cylinder indexing is accomplished by the hand's side. Once you understand this, you can see why a hand that had worn out its window in the frame and now was a loose fit in that window, therefore is laying off to the left of the cylinder and so is not able to complete cylinder rotation. If you are faced with this sort of a problem, follow the repair procedures outlined in Chapter 4 to correct this worn hand window and narrow hand.

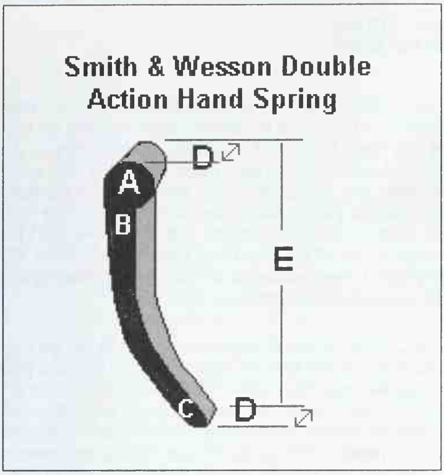
Then there are times when a hand just needs to be a little bit longer, like it would in a case where only the tip of the hand had been broken off; a kind of breakage that seems to occur in single actions much more frequently than it does in double action revolvers. Shown in the illustration here is an excellent and fairly easy way to add material back onto the hand-top, where after preparing a flat at the hand tip you can silver-braze a small piece of flat steel onto the top of the hand, and this small steel addition will be shaped into a new hand top configuration by using a small grinding stone and files, and if you don't have a new hand for comparison; just try using the trial and error method until you have a hand that will achieve good carry-up.



Hand springs, single actions:

This is one part that is sometimes found broken, although most often the breaks are caused by the spring having rusted in half. Even more often the lack of spring tension is found to be caused by an accumulation of old, gummy oil that has hardened into a mass around the spring, so before you condemn the spring outright, get the hammer assembly out of the revolver and try spraying the entire area with a good penetrating oil. The single-action handspring is nothing more than a piece of flat spring stock with a tiny "U" shaped trough formed near one end, through which passes the retaining pin.

Single action hand springs require a hefty tension in order to force the hand to rotate forward by pushing on the tiny flat cam surface on the hand's shank so the idea of cutting and bending up sheet spring stock is not usually a good one. This type of spring is best ground from heavy, pre-tempered spring stock for instance, like the flat portion of an old mainspring. Using the plan outlined in the illustration you can see that it is possible to successfully make new single action hand springs with a bare minimum outlay of tools and effort, although some patience will be needed.



Hand springs, double actions:

Double-action hand springs and the ones used in the Safety Hammerless guns are the same sort of spring, basically a tapered, curved spring with a small "ball" shaped at the top or fat end. In fact the D.A. uses the same spring as the Safety Hammerless in its corresponding caliber, the only difference is in their sizes, the .32 being slightly smaller than the .38 caliber. All double-action and safety hammerless hand-springs serve a dual function as they push forward on the hand while pushing the front sear rearward into the hammer. This spring is pressed sideways into a very nicely made little corresponding "ball shaped" mill cut at the top/rear of the hand. New replacement hand-springs can sometimes be found at the bigger gun parts houses such as Numrich Gun Parts Corp., but in my experience the supplies have always been spotty. We have seen fair replacement springs made from thin pieces of flat or "sheet" stamped spring stock and these sometimes work, at least for a while. The problem with using flat-stamped spring-stock is the new spring is not being held firmly by the hand, allowing it to slide sideways where it can fall out of the hand or at least interfere with the operation of the action. With a little patience and a little bit of care a new hand-spring can be ground from a curved piece of an old mainspring, using a bench grinder and then a Dremel or Foredom hand-piece to final shape the new spring. Keep in mind that your replacement should fit rather snugly into the machined recess in the hand, and that the thickness of the spring's tapered tail will dictate the amount of spring tension available; so if you leave the tail of the hand too heavy it will push the hand too hard into the ratchet and this may interfere with trigger return.

Smith & Wesson Top Break .32 (center-fire) Single-Action Model 1 1/2

Disassembly Instructions

1) First check to be certain the cylinder is unloaded by lifting up on the Barrel Catch #25, and tilt the revolver barrel all the way down to open the action and expose the cylinder's chambers to view. To remove the Cylinder #2: Hold the Barrel Catch #25 in the UP position and pull the Cylinder #2 to the rear while turning it in a counter-clockwise direction. The cylinder will withdraw off the Base Pin #5, toward the rear.

2) Barrel removal: Remove the Joint Pivot Screw from the left side of the hinge on the Frame #3, and use an appropriate straight punch to drive the Joint Pivot #15 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #1 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #4 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly.

3) Grips and sideplate removal: Remove the Stock Screw #8 and the Stocks #s 23 & 24. Remove the two Sideplate Screws #s 10 & 12. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #7 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

4) Mainspring and hammer removal: Use a pair of "spreader" pliers to compress the top of the Mainspring #22 so the hammer Stirrup #28 may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #13; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #22 from the frame side. (Note: On a few early production revolvers the strain screw is an eccentric cam which is located inside the grip frame and accessed through the side of the grip frame.) Carefully rotate the top of the Hand #28 to the rear using a small screwdriver as a lever, and while holding the Hand to the rear; pull the Trigger #26 and hold it to the rear. The Hammer #6 may be pulled about way back and carefully pulled upwards, off of its Hammer Stud #14 and out of the frame.

5) Cylinder stop plate removal: Remove the Stop Plate Screw #11 (located on the frame bottom between the trigger and hinge joint). Hold the frame upside down by the grip, and while holding the Trigger #26 to the rear, strike the frame just behind the hinge joint several short-sharp blows with a plastic mallet; this will case the Stop Plate #27 to jump up out of its seat with the frame. NEVER attempt to pry off the Stop Plate. Once the Stop Plate #27 has jumped loose, remove it and the Cylinder Stop Spring #18, noting their position for re-assembly.

6) Cylinder stop and trigger removal: Drift out the Cylinder Stop Pin (the forward-most of the two pins that pass through the frame from side-to-side) and push the Cylinder Stop #30 out toward the bottom, using a small punch through its window in the frame, under the area where the cylinder rotates. Drift out the Trigger Pin (the rear-most of the two pins that pass through the frame from side to side). The Trigger #26 may be pulled out the bottom of the frame along with its attached Trigger Spring #19.

7) Cylinder disassembly: Insert five fired cartridge cases into the chambers for support. Grasp the Extractor Post #33 in the jaws of a drill chuck and rotate the Cylinder #2 in a counter-clockwise direction to unscrew the Extractor Post #33 from the Extractor #32. Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this should be aligned with the serial numbers on the cylinder for re-assembly.

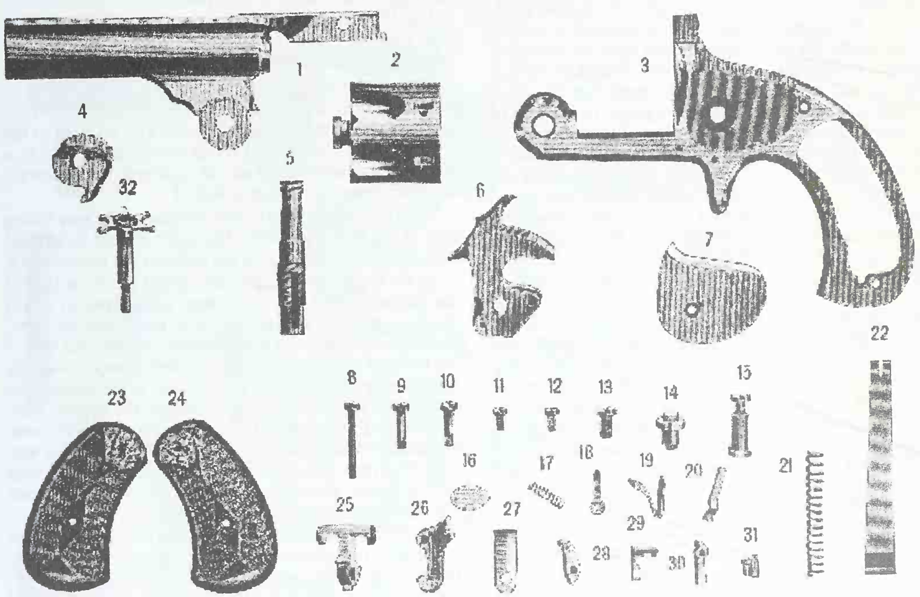
8) Hammer disassembly: Rotate the Hand #29 180 degrees and pull it out of the Hammer. Drift out the pin in the center-front of the Hammer which holds in the Handspring #20, the Handspring now may be slid out of its recess in the hammer. The Hammer Stirrup #28 may be removed by drifting out its pin at the rear of the Hammer. NOTE the position of the Stirrup #28 for re-assembly.

9) Barrel disassembly: Remove the Barrel Catch Screw #9 from the left side of the Barrel top-strap, the Barrel Catch #25 may be withdrawn to the rear. By holding the Barrel #1 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a wooden benchtop, the Barrel Catch Cam #31 and Barrel Catch Cam Spring #17 will fall out of their recess in the top-strap. Note their positions for re-assembly.

Re-assemble the revolver in the reverse order of above.

Smith & Wesson .32 Single-Action Top Break Model No. 1 1/2 , parts nomenclature.

1) Barrel
2) Cylinder
3) Frame
4) Extractor Cam assembly
5) Base Pin
6) Hammer
7) Sideplate
8) Stock Screw
9) Barrel Catch Screw
10) Sideplate Screw, short
11) Stop Plate Screw
12) Sideplate Screw, long
13) Strain Screw
14) Hammer Stud
15) Joint Pivot and Screw
16) Front Sight
17) Barrel Catch Cam Spring
18) Cylinder Stop Spring
19) Trigger Spring
20) Handspring
21) Extractor Spring
22) Mainspring
23) Stock, left hand
24) Stock, right hand
25) Barrel Catch
26) Trigger
27) Stop Plate
28) Hammer Stirrup
29) Hand
30) Cylinder Stop
31) Barrel Catch Cam
32) Extractor
33) Extractor Post (not illustrated)



Smith & Wesson Top Break .32 Double-Action Models

Disassembly Instructions

1) Make certain the revolver is unloaded by lifting up on the Barrel Catch #42, and tilt the revolver barrel all the way down to open the action and expose the cylinder's chambers to view. Check to be certain the cylinder is unloaded. To remove the Cylinder #37: Hold the Barrel Catch #42 in the UP position and pull the Cylinder #37 to the rear while turning it in a counter-clockwise direction. The cylinder will withdraw off the Base Pin #40, toward the rear.

2) Barrel Removal: Remove the Joint Pivot Screw #52a, from the left side of the hinge on the Frame #34, and use an appropriate straight punch to drive the Joint Pivot #52 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #33 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #41 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly.

3) Remove the Stock Screw #49 and the Stocks #s 47 & 48. Remove the Hammer Stud Nut # 55, this part acts as the sideplate screw. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #39 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate. Use a pair of "spreader" pliers to compress the top of the Mainspring #60 so the Hammer Stirrup #56 may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #50; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #60 from the frame side.

4) Trigger-Guard Removal: The Trigger-Guard #35 is a spring, it has no fastening screws and it is held in place by machined tabs at its front and rear tops which mate with machined mortice cuts in the frame. Hold the frame upside down by the grip, and tap the REAR face of the Trigger-Guard #35 with a plastic mallet, causing the rear of the Guard to "jump" out of its seat in the frame. Pull the Trigger #44 all the way to the rear, the Guard may now be moved rearward slightly to disengage its front tab from the frame, tilt the front of the Guard down and push forward to remove. The Trigger Spring #66 will remove with the guard, make note of its position for re-assembly.

5) Action disassembly: Pull the Trigger #35 to the rear and hold it all the way back. The Hammer #43 may now be carefully worked up off its Stud #54 and out of the frame. As you release the Trigger, make note of the Rear Sear #36: it is under spring tension and will rotate down on its own as the trigger moves forward. Drift out the retaining pin #67g for the Rear Sear Spring #67 and remove the spring. Next, drift out the Rear Sear Pin (the rearmost of the two large pins #67a which pass through the frame) and remove the Rear Sear #36, noting its position for reassembly. Drift out the Trigger Pin (the forward most of the two large pins #67a which pass through the frame). Push the Trigger assembly up and to the rear slightly, until the entire face of the Hand #62 is exposed in the sideplate opening. Grasp the Hand #62 and its spring #64 with a small pair of needle-nosed pliers and pull the assembly straight up and out of the frame. The Trigger #44 may be removed through the bottom of the frame while the Front Sear #61 may be removed through the sideplate opening.

In 1st and 2nd Models, make careful note of the relationship of the Trigger assembly (#44 Trigger, #61 Front Sear, #62 Hand) for re-assembly later.

6) The Trigger and Cylinder Stop:

1st and 2nd Models, the Cylinder Stop #67d is mounted in the top-center of the Trigger #44. Under the Cylinder Stop is a small plunger and coil spring which power the stop. The *spring and plunger will be under tension during trigger removal*, use care when removing the trigger that these two tiny parts are not lost.

For 3rd through 5th Models, the Cylinder Stop #63 is held into the frame by a cross pin #67e and may be removed by carefully drifting out this pin.

7) Cylinder disassembly:

Insert six fired cartridge cases into the chambers for support. Grasp the Extractor Rod #45 by its head in the jaws of a drill chuck and rotate the Cylinder #37 in a counter-clockwise direction to unscrew the Extractor Rod #45 from the Extractor #46.

Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this mark should be aligned with the serial numbers on the cylinder for re-assembly.

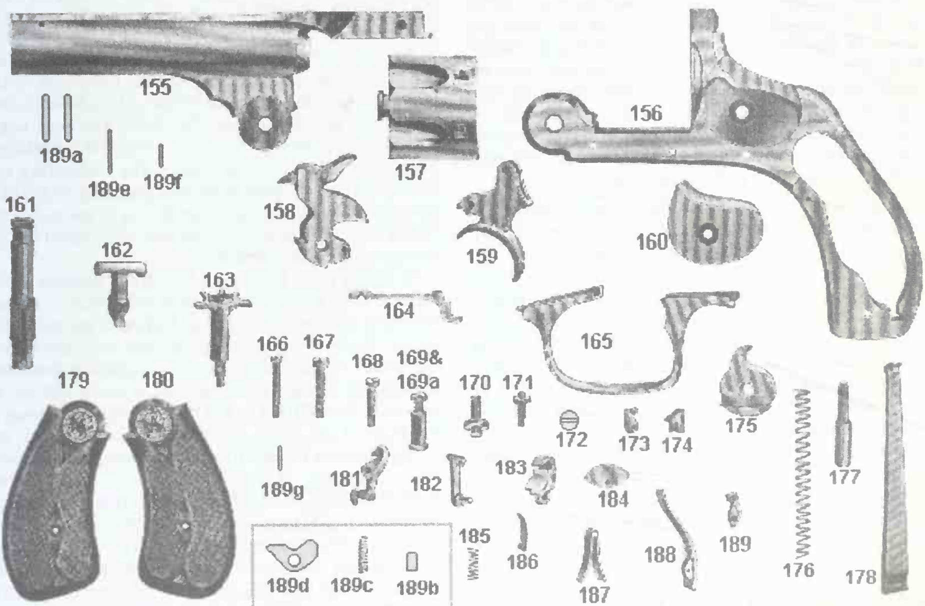
Note: For easier re-assembly; grasp the front 1/4" of the Extractor Rod #45 by its head in the jaws of a drill chuck, assemble the spring onto the Extractor Rod, place the cylinder with the extractor over the rear end of the rod and push the cylinder forward: *Compressing the extractor spring as much as possible* while turning the cylinder in a clock-wise direction until the threads have started by about one half turn. <u>*Stop turning*</u> every one-half turn and allow the extractor to return by spring tension, then push the cylinder in to re-compress the spring and continue tightening in one-half turn increments until the rod is hand tight.

9) Barrel disassembly: Remove the Barrel Catch Screw #51 from the left side of the Barrel top-strap, the Barrel Catch #42 may be withdrawn to the rear. By holding the Barrel #33 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a soft wooden bench-top, the Barrel Catch Cam #58 and Barrel Catch Cam Spring #65 will fall out of their recess in the top-strap. Note their positions for re-assembly.

Reassemble the action in *EXACTLY* the reverse of the order given above.

Smith & Wesson .32 Double-Action; Fourth Model Illustrated.

33) Barrel
34) Frame
35) Trigger Guard
36) Rear Sear
37) Cylinder
38) Front Sight
39) Sideplate
40) Base Pin
41) Extractor Cam
42) Barrel Catch
43) Hammer
44) Trigger
45) Extractor Rod
46) Extractor
47&48) Grips
49) Grip Screw
50) Strain Screw
51) Barrel Catch Screw
52& 52a) Joint Pivot and Screw
53) Hammer Stud
54) Extractor Stud
55) Hammer Stud Nut
56) Stirrup
58) Barrel Catch Cam
59) Extractor Spring
60) Mainspring
61) Front Sear
62) Hand
63) Cylinder Stop 3rd - 5th Model
64) Hand-spring
65) Barrel Catch Cam Spring
66) Trigger Spring
67) Rear Sear Spring
67a) Trigger or Sear Pin
67b) Stop Plunger, 1st - 2nd Model
67c) Stop Spring, 1st - 2nd Model
67d) Cylinder Stop, 1st - 2nd
67e) Stop Pin, 1st - 2nd Model
67f) Stirrup Pin
67g) Sear Spring Pin



Smith & Wesson .32 New Departure / Safety Hammerless Models

Disassembly Instructions

1) Push down (1st Models) or Lift up (2nd or 3rd models) on the Barrel Catch #86 or #442, and tilt the revolver barrel all the way down to open the action. Check to be certain the cylinder is unloaded. To remove the Cylinder #69: Push down on the front of the Cylinder Hook #82 (1st model only) or hold the Barrel Catch #442 in the UP position (2nd or 3rd models) and pull the Cylinder #69 to the rear while turning it in a counter-clockwise direction. The cylinder will withdraw off the Base Pin #72, toward the rear.

2) Remove the Joint Pivot Screw #91a from the left side of the hinge on the Frame #71, and use an appropriate straight pin punch to drive the Joint Pivot #91 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #68 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #83 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly.

3) Remove the Stock Screw #92 and the Stocks #s 99 & 100. Remove the Hammer Stud Nut #94 from the center of the Sideplate #76 and the Sideplate Screw #109 from the rear of the Sideplate. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #76 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

4) Use a pair of "spreader" pliers to compress the top of the Mainspring #78 so the hammer Stirrup #88 may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #93; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #78 from the grip frame side opening. Using a straight pin punch, drift out the pin in the front strap of the grip frame which holds the Cylinder Stop Spring #107 in place and remove the Cylinder Stop Spring by withdrawing to the rear. Using a wooden hammer handle or a small plastic mallet, strike the REAR of the Trigger Guard #77 bow a mild blow on the bow's back side. This will cause the rear of the Trigger Guard (which is a compressed spring itself) to unhook itself from the frame and to drop down slightly. Depress the Safety Lever #79 and pull the Trigger #75 all the way to the rear. The Trigger-Guard #77 may now be removed by first pulling it toward the rear to unhook its front lip from the frame, and then by pivoting it down at the front and pushing forward on the bow. The V-shaped Trigger Spring #106 (Note the position of the Trigger Spring for re-assembly) may now be removed from the Trigger-Guard opening in the frame.

5) Push both the Trigger #75 and the Hammer #73 to their forward positions. Drift out the Cylinder Stop Pin from the frame and push the entire Cylinder Stop #74 DOWN slightly; out of the way of the Hammer. Depress the Safety Lever #79 again and pull the Trigger #75, causing the Hammer #73 to rotate to the rear. With the Stirrup #88 in the REARMOST position, the Hammer #73 may be gently worked up off its Hammer Stud #96 and out of the frame. The Trigger Pin (not shown, this is the large pin that passes through the frame from side-to-side) is now drifted out of the frame. The assembly consisting of the Trigger #75, Hand #84 and Sear #87 is moved up and to the rear so that the entire Hand #84 is visible through the sideplate opening in the frame. NOTE carefully the positioning of these three parts for re-assembly. The Hand #84 and its Spring #104, may be grasped with a pair of needle-nosed pliers and pulled upwards out of its seat with the Trigger and Sear. The Trigger #75 may be withdrawn from the bottom of the frame along with the Cylinder Stop assembly #74 and the Sear #87 taken out through the sideplate opening of the frame.

6) The Safety Lever #79 may be removed by first drifting out its retaining pin from the lower-rear of the rear grip strap, then pivot the bottom of the Safety Lever to the rear and pull down. The Safety Catch or Latch #85 may be powered by a coil spring (1st models and later 3rd models) or a Leaf spring. The Leaf spring will be located on the inside of the rear grip strap and is held by a cross pin, the coil type spring will be located in the Safety Catch recess in the frame, directly behind the top portion of the Safety Catch.

7) Firing pins: The Firing Pin #97 is retained in the frame by the Firing Pin Bushing #89 which is in turn held by a cross pin (not shown) located at the top of the frame. To remove the Firing Pin, the cross pin is first drifted out of the frame. A small pin punch is then used to drive the Firing Pin #97 and its Bushing #89 out of the frame from REAR to FRONT. A small coil spring at the front of the Firing Pin shoulder acts to retract the Firing Pin after firing. Note the positions of these parts for reassembly. These revolvers are equipped with REBOUNDING HAMMERS, the action of which is controlled by Mainspring tension on the Stirrup.

8) Cylinder disassembly: Insert five fired cartridge cases into the chambers for support. Grasp the Extractor Rod #81 in the jaws of a drill chuck and rotate the Cylinder #69 in a counter-clockwise direction to unscrew the Extractor Rod #81 from the Extractor #70. Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this should be aligned with the serial

numbers on the cylinder for re-assembly. To prevent damage to the Extractor Spring #98 during re-assembly, start the Extractor rod into the threads on the Extractor by only one turn, hold the front 1/4" of the Extractor Rod tightly in a padded vise and push the Cylinder forward, compressing the Extractor Spring while you tighten the Extractor Rod by turning the Cylinder in a clock-wise direction.

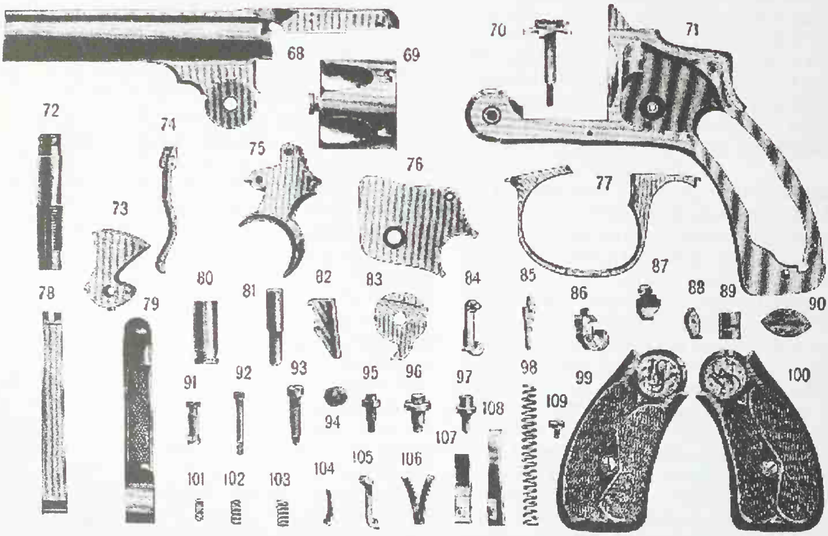
9) Barrel Disassembly: 1st models: Remove the tiny screw from the bottom-rear of the Thumb piece #86b. The Thumb piece will remove by lifting straight up. Drift out the rear-most of the two pins in the barrel's top strap and the Barrel Catch #86 and its coil spring will remove from the bottom of the top strap. Drifting out the forward-most of the two pins in the Barrel's top strap will free the Cylinder Hook #82 and its coil spring for removal from the top.

9a) Barrel Disassembly: 2nd and 3rd models: Remove the Barrel Catch Screw (not shown) from the left side of the Barrel top-strap, the Barrel Catch #442 may be withdrawn to the rear. By holding the Barrel #68 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a wooden bench-top, the Barrel Catch Cam #461 and Barrel Catch Cam Spring will fall out of their recess in the top-strap. Note their positions for re-assembly.

Re-assemble the revolver in exact reverse order of above.

.32 New Departure / Safety Hammerless parts nomenclature: First Model numbering key.

68) Barrel
69) Cylinder
70) Extractor
71) Frame
72) Base Pin
73) Hammer
74) Cylinder Stop
75) Trigger
76) Sideplate
77) Trigger-Guard
78) Mainspring
79) Safety Lever
80) Gas Ring
81) Extractor Rod
82) Cylinder Hook, 1st Model
83) Extractor cam
84) Hand
85) Safety Catch
442) Barrel Catch, 2nd & 3rd models
86) Barrel Catch, 1st model
86b) Thumb piece, 1st model
87) Sear
88) Stirrup
89) Firing Pin Bushing
90) Front Sight
91) Joint Pivot
91a) Joint Pivot Screw
92) Grip Screw
93) Strain Screw
94) Hammer Stud Nut
95) Extractor Stud
96) Hammer Stud
97) Firing Pin
98) Extractor Spring
99-100) Grips (stocks)
101) Barrel Catch Spring
102) Cylinder Hook Spring
103) Firing Pin Return Spring
104) Handspring
105) Split Spring
106) Trigger Spring
107) Cyllinder Stop Spring
108) Latch Spring, leaf
109) Plate Screw



Smith & Wesson Top Break .38 Single-Action First Model

Disassembly Instructions

1) Check to be certain the cylinder is unloaded by lifting up on the Barrel Catch #126, and tilt the revolver barrel all the way down to open the action and expose the cylinder's chamber to view.

2) To remove the Cylinder #112: with the barrel opened all the way. Loosen the Cylinder Catch Screw #112B located in the barrel top strap. Depress the front of the Extractor Rack Screw Catch #122f and pull the Cylinder #112 to the rear, the cylinder assembly will withdraw off the Base Pin #113, toward the rear. Note: the Cylinder Catch #112A will withdraw rearward along with the cylinder, pay attention to this part so that it may be re-installed properly.

3) Barrel removal: Remove the Joint Pivot Screw #143a from the left side of the hinge on the Frame #111, and use an appropriate straight punch to drive the Joint Pivot #143 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #110 is now loose and may be lifted up out of its joint with the frame. The Extractor Gear #125B is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly.

4) Grips and sideplate removal: Remove the Stock Screw #144 and the Stocks #s 118 & 119. Remove the two Sideplate Screws #s 145 & 146. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #115 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

5) Hammer removal: Use a pair of "spreader" pliers to compress the top of the Mainspring #134 so the hammer Stirrup #128 may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #148; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #134 from the frame side. Carefully rotate the top of the Hand #151 to the rear using a small screwdriver as a lever, and while holding the Hand to the rear; pull the Trigger #124 and hold it to the rear. The Hammer #120 may be rotated about way back and carefully pulled upwards, off of its Hammer Stud #141, and out of the frame.

6) Remove the Stop Plate Screw #147 (located on the frame bottom between the trigger and hinge joint). Hold the frame upside down by the grip, and while holding the Trigger #124 to the rear, strike the frame just behind the hinge joint several short-sharp blows with a plastic mallet; this will case the Stop Plate #150 to jump up out of its seat with the frame. NEVER attempt to pry off the Stop Plate. Once the Stop Plate #150 has jumped loose, remove it and the Cylinder Stop Spring #133, noting their position for re-assembly.

7) Drift out the Cylinder Stop Pin (the forward-most of the two pins that pass through the frame from side to side) and push the Cylinder Stop #129 out toward the bottom, using a small punch through its window in the frame, under the area where the cylinder rotates. Drift out the Trigger Pin (the rear-most of the two pins that pass through the frame from side-to-side). The Trigger #124 may be pulled out the bottom of the frame along with its attached Trigger Spring #131.

8) Cylinder disassembly: Insert five fired cartridge cases into the chambers for support. Grasp the Extractor Ratchet #122A on its *flats* with a suitable spanner wrench and rotate the Cylinder #112 in a counter-clockwise direction to unscrew the Extractor Ratchet #122A from the Extractor #121. Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this should be aligned with the serial numbers on the cylinder for re-assembly. The Extractor Rack Screw #122c, and its Nut #122d are a riveted assembly held captive with the Extractor Rack spring inside the Extractor Rack #122A, further disassembly is not recommended.

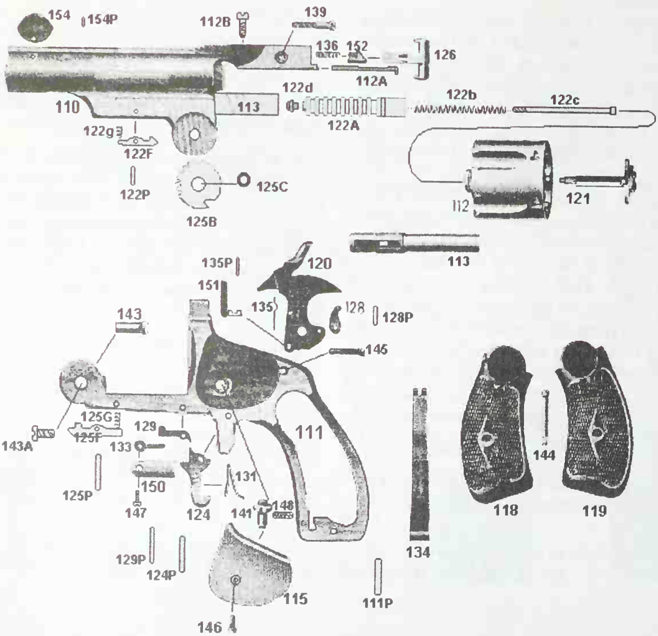
9) Hammer disassembly: Rotate the Hand #151, 180-degrees and pull it out of the Hammer. Drift out the pin in the center-front of the Hammer which holds in the Handspring #135, the Handspring now may be slid out of its recess in the hammer. The Hammer Stirrup #127 or #128 may be removed by drifting out its pin at the rear of the Hammer. NOTE the position of the Stirrup #127 or #128 for re-assembly.

10) Barrel disassembly: Remove the Barrel Catch Screw #139 from the left side of the Barrel top-strap, the Barrel Catch #126 may be withdrawn to the rear. By holding the Barrel #110 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a wooden bench-top, the Barrel Catch Cam #152 and Barrel Catch Cam Spring #136 will fall out of their recess in the top-strap. Note their positions for re-assembly.

Re-assemble the revolver the in reverse order of the above, paying special attention as you do to, the relationships of the *gear teeth* on the extractor rack and the extractor gear.

Smith & Wesson .38 Single Action, Parts nomenclature. First Model (Baby Russian) Illustrated.

110) Barrel
111) Frame
111P) Grip Pin
112) Cylinder
113) Base Pin
115) Sideplate
118 & 119) Grips
120) Hammer
121) Extractor
122a) Extractor Rack
122b) Extractor Spring
122c) Extractor Rack Screw
122d) Extractor Rack nut
122f) Extractor Rack Screw Catch
122) Extractor Rack Catch Spring
122) Extractor Catch Pin
124) Trigger
124P) Trigger Pin
125b) Extractor Gear
125C) Extractor Gear Bushing
125F) Extractor Pawl
125G) Extractor Pawl Spring
125P) Extractor Pawl Pin
126) Barrel Catch
128) Stirrup
129) Cylinder Stop
129P) Cylinder Stop Pin
131) Trigger Spring
133) Cylinder Stop Spring
134) Mainspring
135) Hand Spring
135P) Hand Spring Pin
136) Barrel Catch Cam Spring
139) Barrel Catch Screw
141) Hammer Stud
143) Joint Pivot
143A) Joint Pivot Screw
144) Grip Screw
145) Sideplate Screw, long
146) Sideplate Screw, center
147) Stop Plate Screw
148 Strain Screw
150) Stop Plate
151) Hand
152) Barrel Catch Cam
154) Front Sight
154P) Front Sight Pin



Smith & Wesson Top Break .38 Single-Action Second and Third Models

Disassembly Instructions

1) Check to be certain the cylinder is unloaded by lifting up on the Barrel Catch #126, and tilt the revolver barrel all the way down to open the action, this will expose the cylinder's chambers to view. To remove the Cylinder #112: Hold the Barrel Catch #126 in the UP position and pull the Cylinder #112 to the rear while turning it in a counter-clockwise direction. The cylinder will withdraw off the Base Pin #114, toward the rear.

2) Barrel removal: Remove the Joint Pivot Screw #143a from the left side of the hinge on the Frame #111, and use an appropriate straight punch to drive the Joint Pivot #143 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #110 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #125 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly.

3) Grips and sideplate removal: Remove the Stock Screw #144 and the Stocks #s 118 & 119. Remove the two Sideplate Screws #s 145 & 146 (on 3rd models the Hammer Stud Nut #142 takes the place of the center or short sideplate screw). Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #115 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

4) Mainspring and hammer removal: Use a pair of "spreader" pliers to compress the top of the Mainspring #134 so the hammer Stirrup #127 or #128 may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #138 or #148; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #134 from the frame side. Carefully rotate the top of the Hand #151 to the rear using a small screwdriver as a lever, and while holding the Hand to the rear; pull the Trigger #123 or #124 and hold it to the rear. The Hammer #120 may be rotated about way back and carefully pulled upwards, off of its Hammer Stud #141, and out of the frame.

5) Stop plate or trigger guard removal: *2nd Models*: Remove the Stop Plate Screw #147 (located on the frame bottom between the trigger and hinge joint). Hold the frame upside down by the grip, and while holding the Trigger #124 to the rear, strike the frame just behind the hinge joint several short-sharp blows with a plastic mallet; this will case the Stop Plate #150 to jump up out of its seat with the frame. NEVER attempt to pry off the Stop Plate. Once the Stop Plate #150 has jumped loose, Remove it and the Cylinder Stop Spring #133, noting their position for re-assembly. *3rd Models*: Remove the Guard Screw #149 and remove the Guard #117 or #116 by pulling down on its front. The Cylinder Stop Spring #132 is fitted into, and held captive by a small dovetail slot inside the guard.

6) Cylinder stop and trigger removal: Drift out the Cylinder Stop Pin (the forward-most of the two pins that pass through the frame from side-to-side) and push the Cylinder Stop #129 out toward the bottom, using a small punch through its window in the frame, under the area where the cylinder rotates. Drift out the Trigger Pin (the rear-most of the two pins that pass through the frame from side-to-side). The Trigger #123 or #124 may be pulled out the bottom of the frame along with its attached Trigger Spring #131 on 2nd Models only. 3rd Model Trigger Springs #130 are mounted inside the front grip strap and are held in place by a cross-pin running through the grip frame.

7) Cylinder disassembly: Insert five fired cartridge cases into the chambers for support. Grasp the Extractor Post #122 in the jaws of a drill press or lathe chuck and rotate the Cylinder #112 in a counter-clockwise direction to unscrew the Extractor Post #122 from the Extractor #121. Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this should be aligned with the serial numbers on the cylinder for re-assembly.

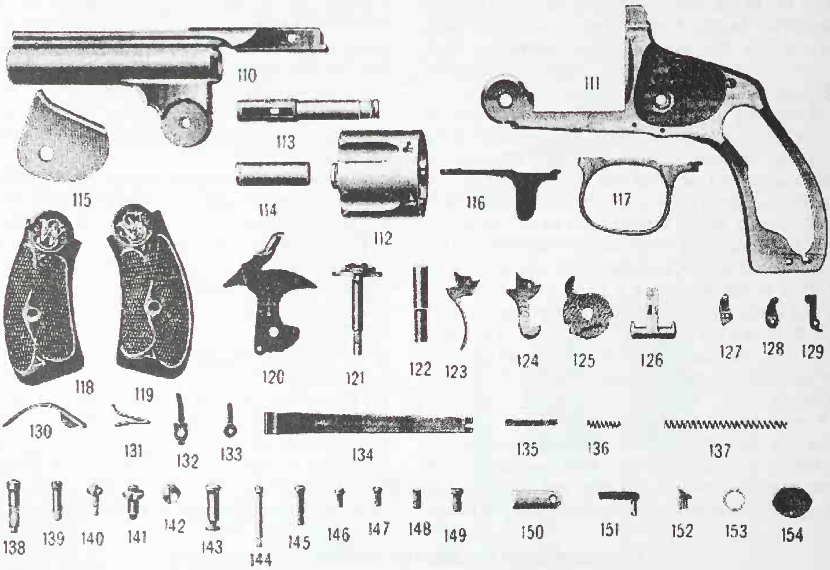
8) Hammer disassembly: Rotate the Hand #151, 180 degrees and pull it out of the Hammer. Drift out the pin in the center-front of the Hammer which holds in the Handspring #135, the Handspring now may be slid out of its recess in the hammer. The Hammer Stirrup #127 or #128 may be removed by drifting out its pin at the rear of the Hammer. NOTE the position of the Stirrup #127 or #128 for re-assembly.

9) Barrel disassembly: Remove the Barrel Catch Screw #139 from the left side of the Barrel top-strap, the Barrel Catch #126 may be withdrawn to the rear. By holding the Barrel #110 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a wooden bench-top, the Barrel Catch Cam #152 and Barrel Catch Cam Spring #136 will fall out of their recess in the top-strap. Note their positions for re-assembly.

Re-assemble the revolver the in reverse order of above.

Smith & Wesson .38 Single Action, Parts nomenclature.
1891 3rd Model Illustrated.

110) Barrel
111) Frame
112) Cylinder
113) Base Pin
114) Gas Ring
115) Sideplate
116) Trigger-Guard, Mexican
117) Trigger-Guard, Third model
118 & 119) Grips
120) Hammer
121) Extractor
122) Extractor Rod
123) Trigger, 3rd model, 1891
124) Trigger, 2nd model
125) Extractor Cam, late 2nd & 3rd models
125a) Extractor Cam, early 2nd model
125b) Extractor Gear, 1st model
126) Barrel Catch
127) Stirrup, 1891 3rd model
128) Stirrup, 1st & 2nd models
129) Cylinder Stop
130) Trigger Spring, 3rd model
131) Trigger Spring, 1st & 2nd models
132) Cylinder Stop Spring
133) Mainspring
135) Hand Spring
136) Barrel Catch Cam Spring
137) Extractor Spring, 2nd & 3rd models
138) Strain Screw, 3rd model
139) Barrel Catch Screw
140) Extractor Stud
141) Hammer Stud
142) Hammer Stud Nut, 3rd model
143) Joint Pivot
143a) Joint Pivot Screw
144) Grip Screw
145) Sideplate Screw, long
146) Sideplate Screw, short
147) Stop Plate Screw
148) Strain Screw, 1st & 2nd models
149) Trigger-Guard Screw, 1891, 3rd model
150) Stop Plate
151) Hand
152) Barrel Catch Cam
154) Front Sight



Smith & Wesson Top Break .38 Double-Action Models

Disassembly Instructions

1) Make certain the revolver is unloaded by lifting up on the Barrel Catch #162, and tilt the revolver barrel all the way down to open the action and expose the cylinder's chambers to view. Check to be certain the cylinder is unloaded. To remove the Cylinder #157: Hold the Barrel Catch #162 in the UP position and pull the Cylinder #37 to the rear while turning it in a counter-clockwise direction. The cylinder will withdraw off the Base Pin #161, toward the rear.

2) Barrel Removal: Remove the Joint Pivot Screw #169a, from the left side of the hinge on the Frame #156, and use an appropriate straight punch to drive the Joint Pivot #169 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #155 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #175 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly.

3) Remove the Stock Screw #166 and the Stock #s 179 & 180. Remove the Hammer Stud Nut #172, this part acts as the sideplate screw. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #160 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate. Use a pair of "spreader" pliers to compress the top of the Mainspring #178 so the Hammer Stirrup #173 may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #167; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #178 from the frame side.

4) Trigger-Guard Removal: The Trigger-Guard #165 is a spring, it has no fastening screws and it is held in place by machined tabs at its front and rear tops which mate with machined mortice cuts in the frame. Hold the frame upside down by the grip, and tap the REAR face of the Trigger-Guard #165 with a plastic mallet, causing the rear of the Guard to "jump" out of its seat in the frame. Pull the Trigger #159 all the way to the rear, the Guard may now be moved rearward slightly to disengage its front tab from the frame, tilt the front of the Guard down and push forward to remove. The Trigger Spring #187 will remove with the guard, make note of its position for reassembly.

5) Action disassembly: Pull the Trigger #159 to the rear and hold it all the way back. The Hammer #158 may now be carefully worked up off its Stud #170 and out of the frame. As you release the Trigger, make note of the Rear Sear #181: it is under spring tension and will rotate down on its own as the trigger moves forward. Drift out the retaining pin #189g for the Rear Sear Spring #188 and remove the spring. Next, drift out the Rear Sear Pin (the rearmost of the two large pins #189a which pass through the frame) and remove the Rear Sear #181, noting its position for reassembly. Drift out the Trigger Pin (the forward most of the two large pins #189a which pass through the frame). Push the Trigger assembly up and to the rear slightly, until the entire face of the Hand #182 is exposed in the sideplate opening. Grasp the Hand #182 and its spring #186 with a small pair of needle-nosed pliers and pull the assembly straight up and out of the frame. The Trigger #159 may be removed through the bottom of the frame while the Front Sear #183 may be removed through the sideplate opening.

In 1st and 2nd Models, make careful note of the relationship of the Trigger assembly (#159 Trigger, #183 Front Sear, #182 Hand) for reassembly later.

6) The Trigger and Cylinder Stop: 1st and 2nd Models, the Cylinder Stop #189d is mounted in the top-center of the Trigger #159. Under the Cylinder Stop is a small plunger and coil spring which power the stop. The *spring and plunger will be under tension during trigger removal*, use care when removing the trigger that these two tiny parts are not lost.

For 3rd through 5th Models, the Cylinder Stop #164 is held into the frame by a cross pin #189e and may be removed by carefully drifting out this pin.

7) Cylinder disassembly: *Insert six fired cartridge cases into the chambers for support*. Grasp the Extractor Rod #177 by its head in the jaws of a drill chuck and rotate the Cylinder #157 in a counter-clockwise direction to unscrew the Extractor Rod #177 from the Extractor #163.

Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this mark should be aligned with the serial numbers on the cylinder for re-assembly.

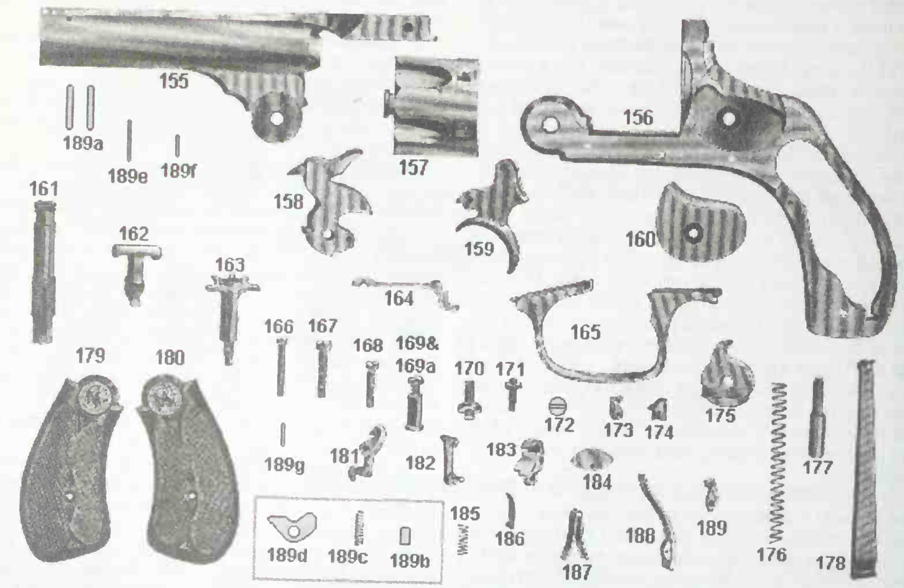
Note: For easier re-assembly; grasp the front 1/4" of the Extractor Rod #177 by its head in the jaws of a drill chuck, assemble the spring onto the Extractor Rod, place the cylinder with the extractor over the rear end of the rod and push the cylinder forward: *Compressing the extractor spring as much as possible* while turning the cylinder in a clock-wise direction until the threads have started by about one-half turn. <u>Stop turning</u> every one-half turn and allow the extractor to return by spring tension, then push the cylinder in to re-compress the spring and continue tightening in one half turn increments until the rod is hand tight.

9) Barrel disassembly: Remove the Barrel Catch Screw #168 from the left side of the Barrel top-strap, the Barrel Catch #162 may be withdrawn to the rear. By holding the Barrel #155 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a soft wooden bench-top, the Barrel Catch Cam #174 and Barrel Catch Cam Spring #185 will fall out of their recess in the top-strap. Note their positions for re-assembly.

Reassemble the action in *EXACTLY* the reverse of the order given above.

Smith & Wesson .38 Double-Action Parts

155) Barrel
156) Frame
157) Cylinder
158) Hammer
159) Trigger
160) Sideplate
161) Base Pin
162) Barrel Catch
163) Extractor
164) Cylinder Stop, 3rd-5th models
165) Trigger-Guard
166) Grip Screw
167) Strain Screw
168) Barrel Catch Screw
169) Joint Pivot
169a) Joint Pivot Screw
170) Hammer Stud
171) Extractor Stud
172) Hammer Stud Nut.
173) Stirrup
174) Barrel Catch Cam
175) Extractor cam
176) Extractor Spring
177) Extractor Rod
178) Mainspring
179&180) Grips
181) Rear Sear
182) Hand
183) Front Sear
184) Front Sight
185) Barrel Catch Cam Spring
186) Handspring
187) Trigger Spring
188) Rear Sear Spring
189) Fly
Not shown: Fly Spring
189a) Trigger and Sear pins
189b) Stop Plinger
189c) Stop Plunger Spring
189d) Stop, 1st and 2nd Models
189e) Stop Pin, 3rd - 5th Models
189f) Rear Sear Spring Pin
189g) Stirrup Pin



Smith & Wesson .38 New Departure / Safety Hammerless Models

Disassembly Instructions

(Keyed to 4th Model parts diagram except where noted)

1) Check to be certain the revolver is unloaded by; pushing down on the Barrel Catch Thumb-piece #224 (1st 2nd or 3rd Models) or Lift up (4th and 5th models) on the Barrel Catch #401, and tilt the revolver barrel all the way down to open the action and expose the cylinder's chambers to view. *Check to be certain the cylinder is unloaded.* To remove the Cylinder #69: Push down on the front of the Cylinder Hook #230 (1st 2nd or 3rd models only) or hold the Barrel Catch #401 in the UP position (2nd or 3rd models) and pull the Cylinder #398 to the rear while turning it in a counter-clockwise direction. The cylinder will withdraw off the Base Pin #429, toward the rear.

2) Remove the Joint Pivot Screw #422a from the left side of the hinge on the Frame #399, and use an appropriate straight pin punch to drive the Joint Pivot #422 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #397 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #435 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly.

3) Remove the Stock Screw #417 and the Stock #s 436 & 437. Remove the Hammer Stud Nut #410 from the center of the Sideplate #400 and the Sideplate Screw #411 from the rear of the Sideplate. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #400 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

4) Use a pair of "spreader" pliers to compress the top of the Mainspring #403 so the hammer Stirrup #421 may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #423; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #403 from the grip frame side opening. Using a straight pin punch, drift out the pin in the front strap of the grip frame which holds the Cylinder Stop Spring #405 in place and remove the Cylinder Stop Spring by withdrawing to the rear. Using a wooden hammer handle or a small plastic mallet, strike the REAR of the Trigger-Guard #402 bow a mild blow on the bow's back side. This will cause the rear of the Trigger-Guard (which is a compressed spring itself) to unhook itself from the frame and to drop down slightly. Depress the Safety Lever #428 and pull the Trigger #432 all the way to the rear. The Trigger-Guard #402 may now be removed by first pulling it toward the rear to unhook its front lip from the frame, and then by pivoting it down at the front and pushing forward on the bow. The V-shaped Trigger Spring #424 (Note the position of the Trigger Spring for re-assembly) may now be removed from the Trigger Guard opening in the frame.

5) Push both the Trigger #432 and the Hammer #433 to their forward positions. Drift out the Cylinder Stop Pin from the frame and push the entire Cylinder Stop #430 DOWN slightly; out of the way of the Hammer. Depress the Safety Lever #428 again and pull the Trigger #432, causing the Hammer #433 to rotate to the rear. With the Stirrup #421 in the REARMOST position, the Hammer #433 may be gently worked up off its Hammer Stud #407 and out of the frame. The Trigger Pin (not numbered, this is the large pin that passes through the frame from side to side) is now drifted out of the frame. The assembly consisting of the Trigger #432, Hand #427 and Sear #416 is moved up and to the rear so that the entire Hand #427 is visible through the sideplate opening in the frame. NOTE carefully the positioning of these three parts for re-assembly. The Hand #427 and its Spring #415, may be grasped with a pair of needle-nosed pliers and pulled upwards out of its seat with the Trigger and Sear. The Trigger #432 may be withdrawn from the bottom of the frame along with the Cylinder Stop assembly #430 and the Sear #416 taken out through the sideplate opening of the frame.

6) The Safety Lever #428 may be removed by first drifting out its retaining pin from the lower-rear of the rear grip strap, then pivot the bottom of the Safety Lever to the rear and pull down. The Safety Catch or Latch #426 may be powered by a coil spring or a Leaf spring. The Leaf spring will be located on the inside of the rear grip strap and is held by a cross pin, the coil type spring will be located in the Safety Catch recess in the frame, directly behind the top portion of the Safety Catch.

7) Firing pins: The Firing Pin #420 is retained in the frame by the Firing Pin Bushing #409 which is in turn held by a cross pin (not shown) located at the top of the frame. To remove the Firing Pin, the cross pin is first drifted out of the frame. A small pin punch is then used to drive the Firing Pin #420 and its Bushing #409 out of the frame from REAR to FRONT. A small coil spring at the front of the Firing Pin shoulder acts to retract the Firing Pin after firing. Note the positions of these parts for re-assembly. These revolvers are equipped with REBOUNDING HAMMERS, the action of which is controlled by Mainspring tension on the rebounding action Stirrup.

8) Cylinder disassembly: Insert five fired cartridge cases into the chambers for support. Grasp the Extractor

Rod #434 in the jaws of a drill chuck and rotate the Cylinder #398 in a counter-clockwise direction to unscrew the Extractor Rod #434 from the Extractor #431.

Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this should be aligned with the serial numbers on the cylinder for re-assembly.

Note: To prevent damage to the Extractor Spring #404 during reassembly, start the Extractor rod into the threads on the Extractor by only one turn, hold the front 1/4" of the Extractor Rod tightly in a padded vise and push the Cylinder forward, compressing the Extractor Spring while you tighten the Extractor Rod by turning the Cylinder in a clock-wise direction.

9) Barrel Disassembly: 2nd or 3rd models: Remove the tiny screw from the bottom-rear of the Thumb piece #224. The Thumb piece will remove by lifting straight up. Drift out the rear-most of the two pins in the barrel's top strap and the Barrel Catch #234 and its coil spring will remove from the bottom of the top strap. Drifting out the forward-most of the two pins in the Barrel's top strap will free the Cylinder Hook #230 and its coil spring for removal from the top. *Barrel disassembly for 1st Models is not recommended.*

9a) Barrel Disassembly: 4th and 5th models: Remove the Barrel Catch Screw (not shown) from the left side of the Barrel top-strap, the Barrel Catch #401 may be withdrawn to the rear. By holding the Barrel #397 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a wooden bench-top, the Barrel Catch Cam #418 and Barrel Catch Cam Spring will fall out of their recess in the top-strap. Note their positions for re-assembly.

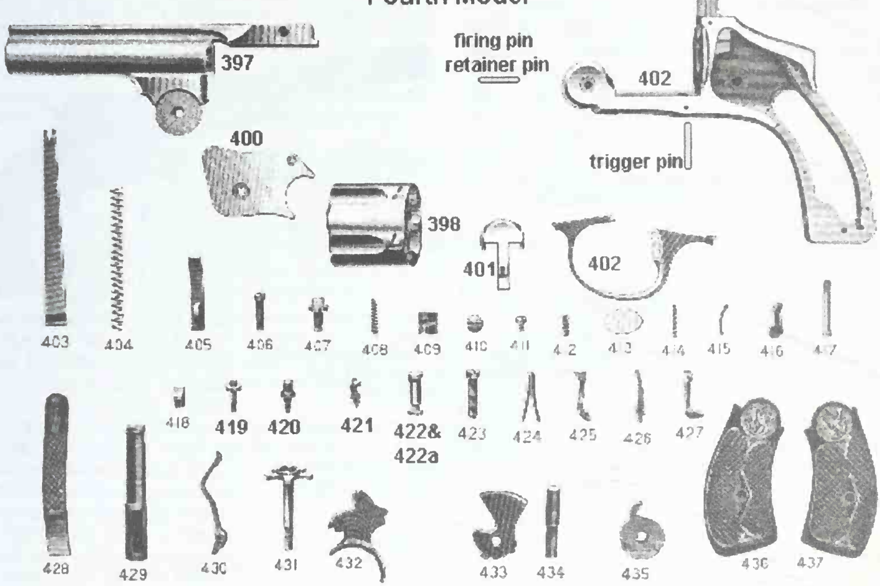
Re-assemble the revolver in exact reverse order of above.

Parts for Smith & Wesson .38
New Departure / Safety Hammerless Models

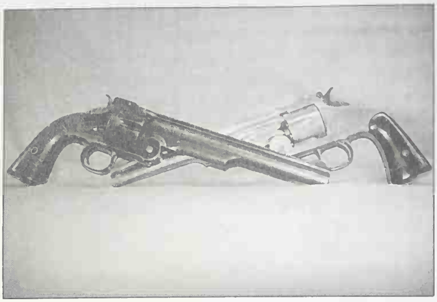
Fourth Model nomenclature

397) Barrel
398) Cylinder
399) Frame
400) Sideplate
401) Barrel Catch
402) Trigger-Guard
403) Mainspring
404) Extractor Spring
405) Cylinder Stop Spring
406) Barrel Catch. Screw, 4th-5th models
407) Hammer Stud
408) Barrel Catch Cam Spring
409) Firing .Pin. Bushing
410) Hammer Stud Nut
411) Plate Screw
412) Firing Pin Return Spring
413) Front Sight
414) Latch Spring, leaf type
414a) same, Coil
415) Handspring
416) Sear
417) Grip Screw
418) Barrel Catch Cam
419) Extractor Stud
420) Firing Pin
421) Stirrup
422) Joint Pivot
422a) Joint Pivot Screw
423) Strain Screw
424) Trigger Spring
425) Split Spring
426) Safety latch
427) Hand
428) Safety Lever
429) Base Pin
430) Cylinder Stop
431) Extractor
432) Trigger
433) Hammer
434) Extractor Rod
435) Extractor Cam
436 & 437) Grips

Fourth Model



Smith & Wesson's Model No. 3 Revolvers: the Large Framed Top Breaks



Smith & Wesson's .44 American revolvers of the 1870s were offered in blue or nickel-plate and featured the simultaneous, automatic ejection of the fired cartridge casings which helped make S&W famous. From the John Watts collection. Diana Boone photography.

Historical background:

Popular in the 19th century both in America and even more so abroad, Smith & Wesson's large frame top-break revolvers are all built on the frame size which was termed the Model No. 3 that was first introduced in 1870 as the .44 Model No. 3 (later known as the American.) Model Number 3's were six-shot, single action (and later double as well), large caliber top-break revolvers whose barrels were mounted on a hinged frame, and along with the cylinder tilted down to be loaded and unloaded. Their barrels were fastened to the frames at the top by way of a "T" shaped barrel catch which is lifted up to open the barrel. These revolvers were very advanced for their day; they all featured automatic, simultaneous extraction of the fired cartridge casings, and when the barrel had reached the fully open position, the coil spring-powered extractor automatically retracted itself back into the cylinder.

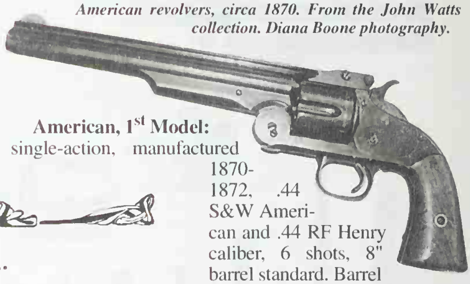
The Model No. 3 frame size included the American models as well as the later improvements and alterations that were made to the original American design which became known as the Model No. 3 Russian, the Model No. 3 Schofield, and the New Model Number 3; single actions all, and then lastly, the Model No. 3 .44 Double Action models. The so-called Frontier models were built on the New Model No. 3 and .44 Double Action revolvers and used lengthened cylinders with longer barrel top-straps and frames to accommodate the .44 and .38 Winchester caliber cartridges which were longer than the standard Smith & Wesson ammunition. S&W produced these large framed top-break Model No. 3 revolvers until the last .44 Double-Action was sold in 1913. Many of today's shooters seem to find the grip of the single action versions uncomfortable for fast work and from what I have been able to glean, this was also the case in the last century when these big revolvers were more respected for their accuracy than for their speed. Even so, when it came to loading and reloading these were the fastest revolvers available. Since the sport of Cowboy Action Shooting has gained so much favor in recent years, the popularity of these fine old revolvers has grown by leaps and bounds right along with their price tags. This same sport and the demand it created have brought about the introduction of modern made copies of some of the Smith & Wesson Model No. 3 revolvers and while these have their own individual repair sections in this book, many of the same trouble-shooting techniques below will apply.

Big Bores from Springfield....

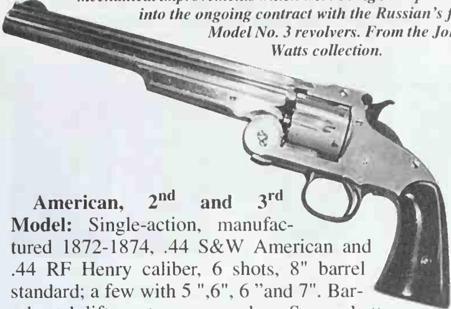
Historical background
Revolvers built on the Model No. 3 frame
Safety cautions, some wear and tear traits of this unusual design
Troubleshooting
Hammer and trigger work, single action
Barrel catch repairs
Schofield eccentric cylinder catch screws
Headspace, cylinder end-shake repairs and the extractor stud
Quick timing: hand repair
Hand springs, single-actions
Hand springs, double-actions
Double action stirrup

Revolvers built on the Model No. 3 frame:

A terrific piece of American history is this fine surviving example from the original U.S. Army contract of 1,000 Smith & Wesson .44 American revolvers, circa 1870. From the John Watts collection. Diana Boone photography.



American, 1st Model: single-action, manufactured 1870-1872, .44 S&W American and .44 RF Henry caliber, 6 shots, 8" barrel standard. Barrel catch lifts up to open revolver. Square butt shape with walnut grips. No hammer-barrel catch interlock. Knurled ratchet pawl slides front-to-rear. Ratchet Gear and Extractor Rack have an equal number of identically sized teeth. Hammer actuated cylinder stop, cylinder stop and trigger pins are identical in diameter, frame edge profile is straight across these pins. Small headed cylinder catch screw on barrel top strap. Serial# 1- about 8,000.



The Second Model .44 American revolvers took on the mechanical improvements which were being incorporated into the ongoing contract with the Russian's for Model No. 3 revolvers. From the John Watts collection.

American, 2nd and 3rd Model: Single-action, manufactured 1872-1874, .44 S&W American and .44 RF Henry caliber, 6 shots, 8" barrel standard; a few with 5 ",6", 6 "and 7". Barrel catch lifts up to open revolver. Square butt shape with walnut grips. Has hammer barrel catch interlock. Knurled ratchet pawl slides front-to-rear. Ratchet Gear and Extractor Rack have one enlarged "starter" tooth on their forward positions. Trigger pin is larger in diameter than cylinder stop pin. Frame has an enlarged boss around trigger pin. Large headed cylinder catch screw on barrel top strap. Early revolvers use hammer actuated cylinder stop, later (3rd Model) is trigger actuated. Serial# about 8,000- 32,800.

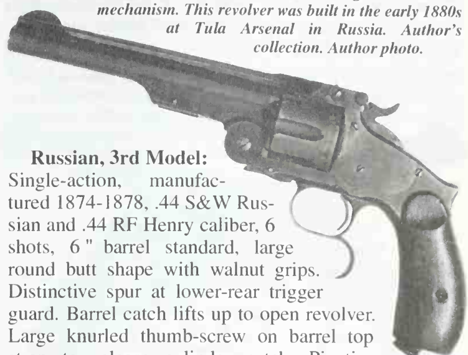
Russian, 1st Model: Single-action, manufactured 1871-1874, .44 S&W Russian caliber, 6 shots, 8" barrel standard a few with 6" and 7". Barrel catch lifts up to open revolver. Square butt shape with walnut grips. The great majority of the 1st Model Russian revolvers are mechanically identical to late production 2nd and 3rd Model Americans except for cylinder chambering. Has hammer barrel catch interlock. Russian contract serial #1-about 20,000, commercial serial numbers in the 6,000-32,800 American number series.

Russian, 2nd Model: Single-action, manufactured 1873-1878, .44 S&W Russian and .44 RF Henry caliber, 6 shots, 7" barrel standard. Large round butt shape with walnut grips. Distinctive spur at lower-rear trigger guard. Barrel catch lifts up to open revolver. Mechanically nearly identical to the 1st Model Russian. Russian 2nd Model total production of 85,200 revolvers.

Russian contract guns numbered in a separate series with each contract lot from 1 to about 20,000 with a total of about 70,000 manufactured[1], and commercial guns above #20,000 were assigned commercial series serial numbers.

Another serial series from 1-approximately to 9,000 exists consisting of: 1,000 sold to Turkey in .44 RF Henry in their own serial number range from 1-1,000. 2,000 more were made in this series in 1877 plus another 5,000 for Japan[2].

1. *Smith & Wesson 1857-1945*, By Neal and Jinks.
2. *Smith & Wesson 1857-1945*, By Neal and Jinks.

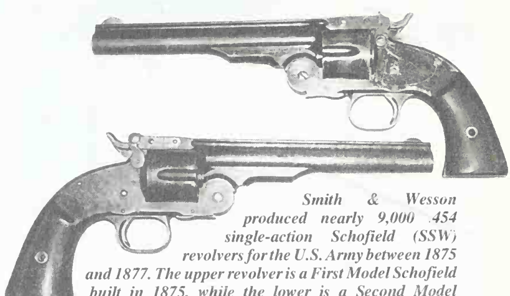


Second and Third Model Russian .44s used the odd saw-handle shaped butt and were equipped with a steadying spur on the rear of their trigger-guards. The Third Model shown here used a much more simplified form of the rack and gear extraction mechanism. This revolver was built in the early 1880s at Tula Arsenal in Russia. Author's collection. Author photo.

Russian, 3rd Model: Single-action, manufactured 1874-1878, .44 S&W Russian and .44 RF Henry caliber, 6 shots, 6 " barrel standard, large round butt shape with walnut grips. Distinctive spur at lower-rear trigger guard. Barrel catch lifts up to open revolver. Large knurled thumb-screw on barrel top strap to release cylinder catch. Pivoting, rocker-type ratchet pawl mounted at frame hinge with cross pin. Pivoting, rocker type cylinder release mounted under barrel extractor housing with cross pin. Russian 3rd Model totals manufactured: 60,638

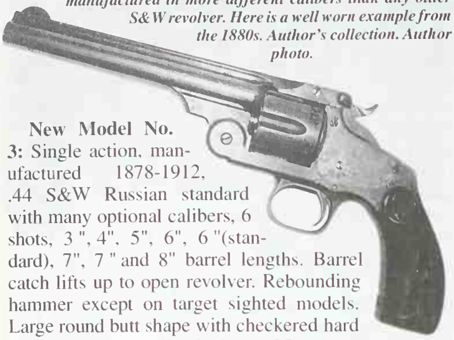
Russian Contract revolvers: 41,138
Commercial revolvers: 13,500
Turkish Model revolvers: 5,000
Japanese Model revolvers: 1,000

Schofield, 1st Model: Single-action, manufactured 1875, .45 S&W caliber, 6 shots, 7" barrel standard. Barrel catch pulls to the rear to open revolver. Pivoting, rocker-type ratchet pawl mounted at frame hinge with cross pin. Square butt shape with walnut grips. Serial# 1-3,035.



Smith & Wesson produced nearly 9,000 .454 single-action Schofield (SSW) revolvers for the U.S. Army between 1875 and 1877. The upper revolver is a First Model Schofield built in 1875, while the lower is a Second Model manufactured in 1877. Notice the rounded tops on the Second Model manufactured in 1877. Notice the rounded tops on the Second Model's barrel catch compared to that on the First Model. Diana Boone photographer. Bullet 'N Press photo.

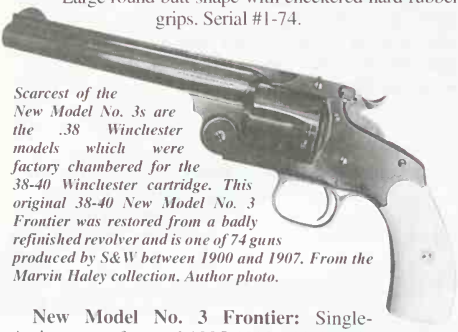
Schofield, 2nd Model: Single-action, manufactured 1876-1877, .45 S&W caliber, 6 shots, 7" barrel standard. Barrel catch pulls to the rear to open revolver. Pivoting, rocker-type ratchet pawl mounted at frame hinge with cross pin. Square butt shape with walnut stocks. Serial #3,036-to about 8,969.



The New Model No. 3 introduced in 1878 was the latest and most refined in S&Ws the single action top-break line. This model was manufactured in more different calibers than any other S&W revolver. Here is a well worn example from the 1880s. Author's collection. Author photo.

New Model No. 3: Single action, manufactured 1878-1912, .44 S&W Russian standard with many optional calibers, 6 shots, 3 ", 4", 5", 6", 6 "(standard), 7", 7 " and 8" barrel lengths. Barrel catch lifts up to open revolver. Rebounding hammer except on target sighted models. Large round butt shape with checkered hard rubber or walnut grips. Serial #1-35,796.

New Model No. 3, 38-40 Winchester: single action, manufactured 1900-1907, 38-40 Winchester caliber, 4" and 6 "barrel. Mechanically identical to New Model No. 3. Large round butt shape with checkered hard rubber grips. Serial #1-74.



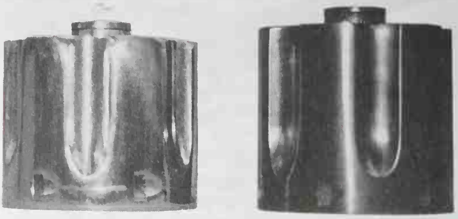
Scarcest of the New Model No. 3s are the .38 Winchester models which were factory chambered for the 38-40 Winchester cartridge. This original 38-40 New Model No. 3 Frontier was restored from a badly refinished revolver and is one of 74 guns produced by S&W between 1900 and 1907. From the Marvin Haley collection. Author photo.

New Model No. 3 Frontier: Single-Action, manufactured 1885-1908, .44-40 Winchester caliber, 4", 5" and 6 " barrel lengths. Mechanically identical to New Model No. 3. Large round butt shape with checkered hard rubber grips. Serial #1-2,072.

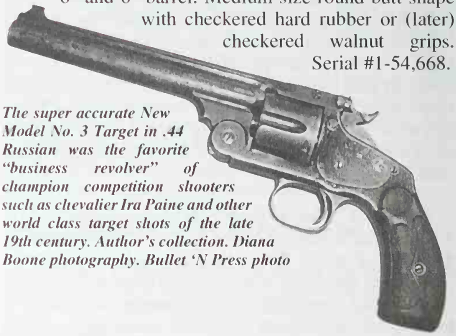
New Model No. 3 Turkish Model: Single-Action, manufactured 1879-1883, .44 rim fire caliber, 6" barrel standard. Mechanically identical to New Model No. 3. Large round butt shape with checkered walnut grips. Serial# 1-5,461.

New Model No. 3 Target: Single-Action, manufactured 1887-1910, 32-44 and 38-44 S&W Target calibers, 6" barrel standard. Large round butt shape with checkered hard rubber or walnut grips. Serial #1-5,461.

On the left is the standard .44 Russian caliber cylinder which is about 1 - 7/16 inches long, on the right is the 1- 9/16 inches long 44-40 Frontier cylinder. Diana Boone photograph. Bullet 'N Press photo.

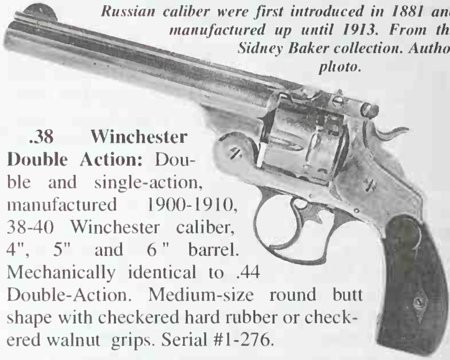


.44 Double Action: Double and single-action, manufactured 1881-1913, .44 S&W Russian caliber, 4", 5", 6" and 6 "barrel. Medium size round butt shape with checkered hard rubber or (later) checkered walnut grips. Serial #1-54,668.



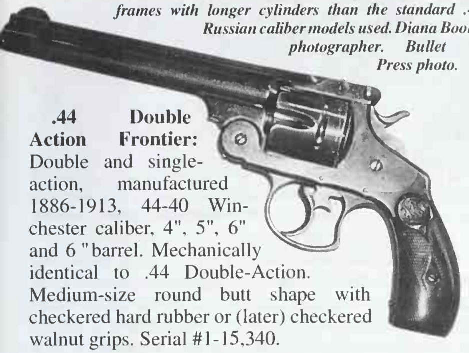
The super accurate New Model No. 3 Target in .44 Russian was the favorite "business revolver" of champion competition shooters such as chevalier Ira Paine and other world class target shots of the late 19th century. Author's collection. Diana Boone photography. Bullet 'N Press photo

Double-action Model Number Three revolvers in .44 Russian caliber were first introduced in 1881 and manufactured up until 1913. From the Sidney Baker collection. Author photo.



.38 Winchester Double Action: Double and single-action, manufactured 1900-1910, 38-40 Winchester caliber, 4", 5" and 6 " barrel. Mechanically identical to .44 Double-Action. Medium-size round butt shape with checkered hard rubber or checkered walnut grips. Serial #1-276.

.44 Double Action Wesson Favorite: Double and single-action, manufactured 1882-1883, .44 S&W Russian caliber, 5" barrel standard. Mechanically identical to .44 Double-Action. Medium-size round butt shape with checkered hard rubber or checkered walnut grips. Serial #8,900-10,100 within the .44 Double-Action numbering series.



S&W finally introduced the 44-40 Winchester cartridge to the double-action line in 1886 with the .44 Double-Action Frontier. In order to accommodate the longer Winchester cartridges these guns, as well as the 38-40 caliber revolvers were all built on specially lengthened frames with longer cylinders than the standard .44 Russian caliber models used. Diana Boone photographer. Bullet 'N Press photo.

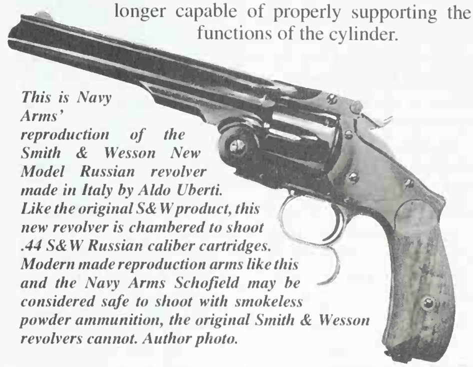
.44 Double Action Frontier: Double and single-action, manufactured 1886-1913, 44-40 Winchester caliber, 4", 5", 6" and 6 "barrel. Mechanically identical to .44 Double-Action. Medium-size round butt shape with checkered hard rubber or (later) checkered walnut grips. Serial #1-15,340.

Model 320 Revolving Rifle: Single-action, manufactured 1879-1887, .320 S&W rifle caliber, 16", 18" and 20" barrels. Mechanically identical to New Model No. 3 except hammer is equipped with fly and trigger and is altered to suit. Large round butt shape with checkered hard rubber grips. Detachable walnut shoulder stocks with steel fittings, checkered hard rubber buttplate and forearm. Serial# 1-977.

Safety cautions, some wear and tear traits of this unusual design:

Before you even begin; one school of thought has it that these original guns should not be fired at all, and especially not in a cowboy competition where the risk of damage can easily be much greater than it might be in casual shooting. We know that some folks will still shoot them though, they simply want to experience what it was like to shoot an original, and most people who feel this way will go out of their way to be more careful than usual in tending to their weaponry. Another important concept to grasp, and perhaps the first thing you should be aware of is that these are all *black powder cartridge guns*. In spite of whatever you may have been told; this includes *any and all* of the Model No. 3 top-breaks that were sold after the turn of the century, in the so-called *smokeless-powder era*. Although many of these revolvers have been fired with smokeless ammunition over the years, and to make matters worse some have been through the hands of ammunition hand-loaders who like to *soup-up* ammo to a level hotter than factory specs because they believe that makes it shoot better for some unknown reason.

The use of smokeless ammunition by itself is bad enough and even if the revolver's cylinder has not exploded, I can assure you that the revolver will have endured other kinds of damages; some of these will be easy to spot, some not so. For instance, a quick tell-tale that a Model No. 3 may have been used with smokeless powder ammo is that it will have a noticeable amount of cylinder end-shake, which will normally be found along with a larger than normal barrel-to-cylinder gap. Taken together, these are indications that the frame and barrel, as a unit; have become stretched, lengthwise. What happens when a frame stretches is that the cylinder opening which is formed by the frame/barrel assembly has become longer than it ought to be, and it is no longer capable of properly supporting the functions of the cylinder.



This is Navy Arms' reproduction of the Smith & Wesson New Model Russian revolver made in Italy by Aldo Uberti. Like the original S&W product, this new revolver is chambered to shoot .44 S&W Russian caliber cartridges. Modern made reproduction arms like this and the Navy Arms Schofield may be considered safe to shoot with smokeless powder ammunition, the original Smith & Wesson revolvers cannot. Author photo.

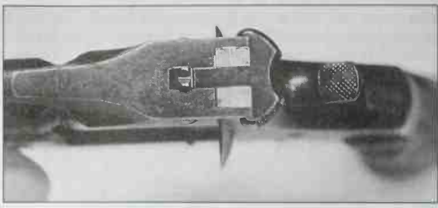
This frame stretching may sound odd but it is actually a very normal occurrence at least to some degree in all modern revolvers, most of which will develop excess headspace, cylinder end-shake and barrel-to-cylinder gaps after having been fired considerably. Of course the *normal* course corrections for this situation in a modern side-swing revolver would be to repair the cylinder end-shake, correct the headspace, set the barrel back rearward into the frame one turn and then re-adjust that barrel-cylinder gap. For reasons that will be patently obvious to you once you have looked over how the top-break design works, we can't do that with this sort of a revolver because their barrels are set at a fixed location; so once that frame-barrel unit has been stretched, you are pretty much stuck with it. As you will see, some of the troubles caused by this frame stretching will be correctable, but only at the sacrifice of some others which the owner will have to learn to live with. For instance, an excess of cylinder end-shake indicates that the cylinder along with the extractor is moving forward, farther away from the standing breech than specifications call for; creating a condition of *excess headspace*, this is a situation that will soon lead to misfires and undependable primer ignition. What's more, this forward cylinder movement has also moved the extractor ratchet teeth forward, bringing them farther away from the location where they could have full contact with the hand and that will quickly lead to indexing problems. The excess headspace and most of the cylinder end-shake can often be corrected by shimming the cylinder back toward the rear. This repair will bring back the required reliable ignition and will help to restore correct cylinder timing and indexing, however it

will leave the revolver with a larger than normal barrel-to-cylinder gap.

Troubleshooting S&W's Large Frame Top Breaks:

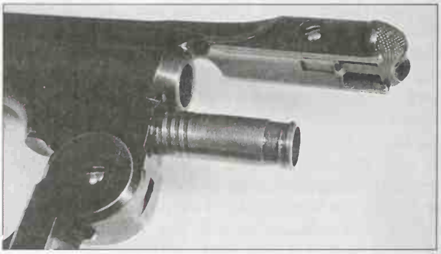
These troubleshooting procedures were originally developed by the author for use with single-action Smith & Wesson Model No. 3 revolvers, but owing to the many shared design features of the single and double-action top-breaks, with a little creativity on the part of the gunsmith this system can be used to effectively troubleshoot the large framed double-actions as well. If it seems from some of the earlier statements like I have been stressing the idea that you might want to pay close attention to any looseness in the frame/barrel/cylinder areas of these revolvers, I certainly am. When Model No. 3 S&Ws are right and proper, they will lock up like the proverbial Swiss bank vault of legend, these revolvers were finely tuned machines and when they are just right they are just a joy to use. Looseness in any finely tuned machine is a sign of hard use or abuse, in the large frame big Smith & Wesson top breaks any apparent looseness should be the gunsmith's first indicator that something is amiss. Here are a few areas that are unique to these top-break revolvers that you may give some attention to.

After you have made absolutely certain that the chambers in the revolver's cylinder are empty, start your troubleshooting procedure with the barrel closed and locked, holding the gun in two hands by the barrel and by the grip. Let's test the fit of the barrel to the frame by applying pressure; as if you were going to break open the barrel without operating the barrel catch in order to see if there is any movement at the place where the barrel catch locks the gun closed. A small, and I really mean small, amount of movement is normal for a gun that has seen some use. We should be surprised to see a well used old top-break that did not have at least a small amount of movement here. On the other hand larger amounts of barrel looseness at this juncture may well be a sign of long use with smokeless powder and/or possibly even of a bent frame. Sometimes their frames were bent by abuse such as the actions of some careless shooter flailing the barrel closed with a flourish of one-handed bravado, and then at other times these guns were used as hammers just as I suppose, a lot of older Colts were. But here is something you should think about; whether the looseness has been caused by abuse, or by the wrong ammunition, when the top-break revolver's barrel lock-up seems to be that awfully loose, you will also see that this same gun displays a host of other operational maladies. It will probably have problems such as; excess headspace, an overly large barrel to cylinder gap, and poor cylinder lock-up, (the latter is because the cylinder stop cannot lock the cylinder normally since the cylinder itself is moving up away from the cylinder stop along with that loose barrel), low firing pin strikes, and a small plethora of other ills.



If you look close at the junction of the barrel with the frame you can see the airgap which is present in this 1890s manufactured .44 Double-Action Frontier model as the result of this revolver being fired with smokeless powder ammunition. Author photo.

As mentioned earlier, after long use with smokeless powder loads, or sometimes even just a few heavy hand loads may have caused the frame and the barrel's top-strap to be stretched lengthwise. Sometimes this stretching can be repaired at least to a degree, sometimes it cannot. From the very start, beware of a gun that is very loose in this area, or of one that shows a large "barrel to cylinder" gap; no matter how nice it appears to be otherwise, those are indicators that it could end up being real trouble. In a good, tight gun the barrel-to-cylinder gap should be from about .005 to .008" (that is, the space or gap between the barrel and the cylinder should be five-to-eight thousandths-of-an-inch wide), any gap that is appreciably larger than this can be a sign of a problem. The author has seen some badly worn revolvers with barrel-cylinder gaps that were a tenth of an inch wide or even larger, revolvers like those have unfortunately been abused beyond any reasonable limits of safe repair, whenever possible try to pass revolvers like these by; they are quite simply, finished.

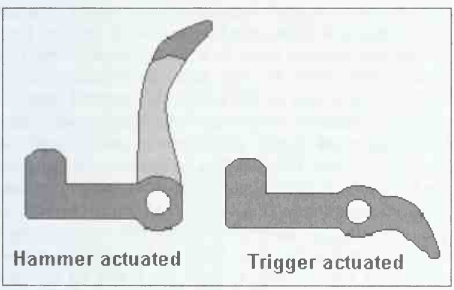


This is what a Model No. 3 Double-Action .44 looks like with the cylinder removed. The large tube directly beneath the bore is the base pin, note the large diameter interrupted threads at its rear. Under the barrel catch you can see the "lug" projecting downward which acts as a cylinder catch, when the barrel catch is lifted up, the lug goes with it, freeing the cylinder for removal. Author photo.

Base Pins: The base pin is the axle shaft that the cylinder rotates on. It is a large, hollow steel shaft which is screwed into the back of the barrel, just under the bore. There is a tendency for base pins to be loose in the barrel especially on American, Russian and early Schofield models, and this

may also be a sign of abuse over the years. With the barrel open, try "wobbling" the cylinder from side-to-side, then up and down. If you can see a lot of movement, or what seems to be a lot, remove the cylinder and check to see if that base pin itself is loose within the barrel; the base pin should be a rock-solid tight fit in the barrel. Often a new base pin with slightly oversized threads will have to be manufactured and hand fitted to the barrel, but this can be a fairly expensive job. If the base pin is not loose, but you notice that you can wobble the cylinder more than you think is normal, this indicates that the base pin and/or the cylinder axis are worn severely. The best "cure" will be to manufacture a new base pin with a slightly oversized cylinder axis to try and compensate somewhat for the wear.

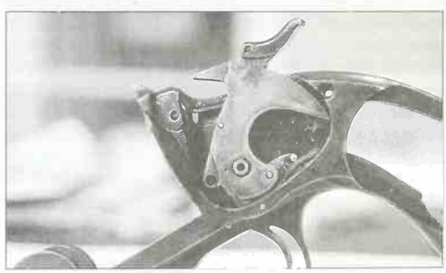
While we are poking around in the cylinder area, if the gun is an American or a Russian model; look over the front face of the cylinder closely and inspect it for damage. Sometimes these guns were disassembled by people who didn't know the correct way to remove the cylinders and they simply hammered the cylinder toward the rear until it came out. Incredible yes, but it happened and guns that have been abused like this will sometimes have cylinders that are damaged beyond any glimmer of repair. If you have found hammer marks on the cylinder face, open the gun up and look closely at the bottom side of the barrels top-strap just at the rear of the cylinder, where the "hook" for the cylinder catch should be. Chances are good that if they beat that cylinder out of the gun, they have probably broken the hook off the cylinder catch as well.



Two type of cylinder stops were used in Model No. 3 Single Actions, the early hammer actuated type on the left and the later trigger actuated cylinder stop.

On the later single-action guns with trigger actuated cylinder stops (this includes last model American sometimes called the 3rd Model American, about 98% of all Russian models, all Schofields and all of the New Model Number 3), while the gun closed and the hammer is all the way down, check the cylinder for rotational play (radial play). The cylinder should have almost no discernable rotational movement. A cylinder that shows lots of rotational movement can be an indication of other problems, on these; try pulling the trigger to see if this reduces the radial movement at all. If the amount of cylinder movement is reduced when the trigger is pulled and held back, that is an indication that the trigger's sear-tip may be broken, or that the hammer itself may have been broken or altered; in either case what is happening is the trigger is being allowed to move farther forward than normal, as it does it is forcing the cylinder stop to be pulled down out of the stop notches in the cylinder. On the other hand, if the cylinder radial play remains constant while the trigger is pulled back; the gun may have a worn cylinder stop and/or it may have worn stop notches in the cylinder. Look at those stop notches carefully, if they appear to be opened up near their tops but smaller at the bottom, you may be looking at having to replace the cylinder to remove that radial play. The window or opening in the frame through which the cylinder stop moves might also be worn on its sides, this would allow the cylinder stop to shake side-to-side, thus showing up as rotational movement in the cylinder.

For our next test, pull the hammer back to the half-cock position; with the hammer resting there the cylinder should spin freely. You should *not hear* an audible "click-click" like you would on a single-action Colt. Lift up on the barrel catch, it should unlock the barrel fully, and freely without ever contacting the hammer. Close the barrel once again and pull *lightly* on the trigger; the trigger should be caught firmly in the half-cock notch of the hammer and should not go easily to the rear. Do not pull the trigger very hard; trying to force the issue here could easily break off that fragile trigger sear. If the hammer was contacted by the barrel catch when the barrel was opened or closed while the hammer is at the half-cock position, or if the trigger did not hold the hammer at the half-cock position; you probably have a gun with a broken trigger sear tip, and likely, a broken hammer notch (or notches) as well. If you heard that "click-click" I mentioned earlier when the cylinder was rotated while the hammer was at half-cock; something is wrong. Either the hand has been damaged, altered, possibly it is a too-long Italian replacement hand, or the hammer has been played with so much that the hand is being *positioned too high* in its window. This situation bears closer scrutiny.



This Schofield hammer has badly ruined notches; the hammer is at full-cock, yet notice the large distance between the frame and the base of the hammer spur? If the notches were in good shape this hammer would be able to travel at least another quarter-inch before it reached the fully cocked position. Author photo.

Bring that hammer back to the full-cock position for the next step in this test procedure. Pay attention to *where exactly it is during the hammer's travel* that the hammer and trigger actually make and lock at full-cock.

In the ideal situation; the trigger's sear-tip should drop into the hammer's full cock-notch fully at just exactly the same moment as the cylinder was locked into battery (index) by the cylinder stop. In addition, this all should have occurred when the hammer was a hair's breadth from being as far back as it could physically travel within it's cutout in the lock frame. (A "hair's breadth" is one of those inferred measurements without an exact definition, it means perhaps one-thirty second of an inch, but *not* an eighth or a quarter-of-an-inch.) If the hammer reached full cock much before this point, it is a sure bet that either the hammer has a broken cock notch, the trigger's sear-tip is broken, or both.

What happens when the hammer reaches full cock before the cylinder has been pushed into index by the hand is this: (index: cylinder chamber locked into position with the barrel bore ready-to-fire) The chamber under the hammer is not yet lined up with the barrel, so that cylinder is still not locked in battery; here is a potentially very dangerous situation and one that no gunsmith, whether they be amateur or professional should never ignore. Every so often, someone tells me they have a gun that does this and that they simply roll the cylinder into battery with their fingers, after cocking the hammer. That is all very nice but tell me; what in the world is going to happen that one time they forget to rotate the cylinder into battery manually?

If you are looking at a top-break revolver that came in with the above described problem, open it up and remove the cylinder. Spend some time to carefully examine the back of the barrel at the bottom of the forcing cone; just above where the base pin is threaded in, in order to make certain that the barrel is not cracked there. While there, you should also look over the front face of the cylinder for cracks, paying special attention just around the center near the gas ring. These two areas are where damage will occur first when a gun has been fired with the cylinder out of time, like the one described above. Sometimes the same damages are found when hot hand-loaded ammunition made with smokeless powder have been used. As long as you are inspecting the barrel for damages, use a good "white" bore light to check the inside of the barrel very closely and look for bulges. If you see a suspicious area, try pulling a tight fitting cloth patch on a cleaning rod through the bore just to see if you can *feel* any loose spots, this makes a quick and effective test for a bulged barrel.

Before you ask; no, Smith & Wesson Model No. 3 top-break revolvers with bulged barrels normally cannot be repaired by lining them in the original .44 or .45 caliber. This is because the bore is simply so close to the base pin threads that you won't be able to safely install a liner of sufficient thickness, such a barrel would have to be replaced. Such a barrel could be lined by using an extremely thin-wall liner but the liner would be much too thin for safety's sake and could only be used for "*lookin' at*" so I would never recommend it. Target Model No. 3's in .32-44 or .38-44 caliber may be repaired by lining the barrel to its original caliber, or even by re-boring and re-rifling to a larger caliber such as .44 S&W Russian along with a cylinder re-chamber. One option that works for some .44 Russian caliber guns with bad barrels is to have the barrel re-bored and re-rifled and the cylinder re-chambered to accept the .45 S&W Schofield cartridge. Cliff LaBounty has re-bored and rifled several New Model Number 3 barrels and one .44 Double Action barrel for me in this caliber, all with superb results. Cliff cuts the rifling with five equal lands and grooves, just like the real thing; only I believe that his craftsmanship is actually better than the factory's.

That little bit on bulged barrels brings to mind something that I have seen a lot of over the years. A very nice old revolver is found laying around the attic along with its *equally old* ammo, where the two have lain dormant for the last 75 years or so, we'll call it Grand-dad's gun. After finding it, someone decides that it would be nice to see what it feels like to actually shoot Grandpa's nice old gun, then they proceed to load up the nice old gun with Grand-dad's old ammo. After all, it worked for Grand-dad, so it must be OK. . . right? OK, then the man fires the first shot, but it doesn't make such a loud noise, and he thinks, *hey . . . that wasn't so bad*. So he re-cocks the arm and fires the second shot which (of course) goes off with a much louder noise, and this time the shooter notices there is a lot of smoke now that wasn't there after the first shot. Nevertheless, he is undaunted and tries to fire a third shot but this time the revolver refuses to cock and the cylinder won't turn. What happened to our unsuspecting shooter and old grand-dad's gun? The first shot he attempted to fire with the very old and by now undependable ammunition was what we sometimes call a "squib load" or a "misfire", in this case the primer exploded but the powder never ignited, however the small force of the primer's explosion alone was enough to drive the bullet up into the barrel, where it now lies lodged tightly, along with much of the unburned powder charge. A second shot is now fired, unlike the first shot, its powder charge ignited normally sending the second bullet to run full strength right-smack into the back side of the bullet from the first shot; which you will recall was already stuck in the barrel. Now Grandpa's nice old gun has a bulged barrel, and quite possibly a bulged or cracked cylinder, and it has effectively been ruined. This sort of scene is an all too common occurrence that happens when the shooter is not familiar with the firearms they find laying around the home. Apparently a lot of people just don't realize what is obvious to most experienced shooters; that a gun should recoil when it is fired, or that at least they should actually see a bullet hole through the target after firing a shot. Believe it or not, some folks just don't understand that.

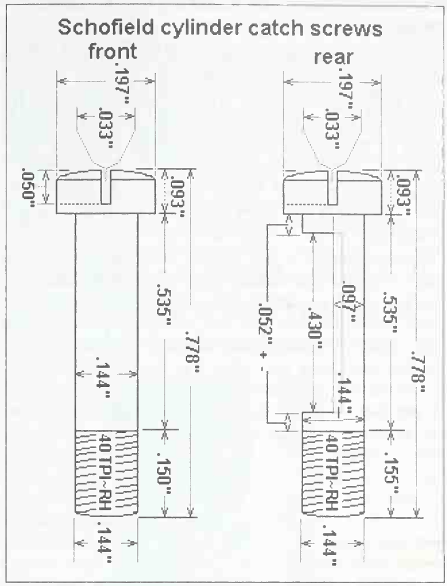
Hammer and trigger work, single action

Hammer notches and trigger sears for all the single action models are not exactly the same but are very similar to one another. For more detailed trigger and hammer specifics, please read the trigger section in the Navy Arms Schofield portion of Chapter 5.

Barrel catch repairs.

Here is a quick and permanent repair trick for revolvers that exhibit play in the barrel catch area. It's a comparatively easy repair that will sometimes cure a surprisingly large amount of barrel looseness, if the looseness is occurring at the barrel catch. This specific repair is applicable to all the Model No. 3 revolvers with a barrel catch that lifts up; a description that includes the double actions, leaving out only the Schofield. Refer to the takedown instructions for your revolver and remove the cylinder first, then re-close the barrel. With the revolver closed, hold the gun firmly by the top strap and push the barrel catch forward as hard as you can with the thumb of the same hand. Now with your other hand, try to move the frame up and down and note if the "play" you experienced earlier has either diminished or disappeared. If the play has either lessened or has gone away while you held that barrel catch hard forward, then it's a pretty safe bet that most of that play is being caused by a worn barrel catch screw.

This fairly easy repair then, it only involves your removing the old barrel catch screw and then manufacturing a new screw that has a slightly oversized shank area, one that fits the screw hole in the barrel catch more precisely than the original-worn screw. On some really worn guns the screw holes through the barrel catches may have become worn to an oval shape from wear. Even though these barrel catches were fairly hard steel, the barrel catch screw forms the axle or pivot for the catch so that it and the barrel catch hole will have endured a lot of abuse simply by performing their normal, intended functions. In such guns it is advisable to ream the hole in the barrel catch to a very slight oversize, just large enough so that the hole is round once again and no more. That means you will also have to ream the corresponding portion of the hole through the left side of the barrel's top-strap to the same new oversize; so that the new screw shank which you will also have made oversized, will pass through it. Often this little repair all by itself will remove most, if not all of the play in the barrel catch area. Once you have that new screw fitted, don't forget that this is a critical part of the revolver's locking mechanism and that the screw should be hardened properly as mentioned in the section on making screws.



Schofield eccentric cylinder catch screws

The cylinder catch which is the separate part that actually forms the top-rear of the barrel's top-strap on the Schofield models is what holds the cylinder in place while the gun is opened for extraction. These use two cross screws to hold the cylinder catch onto the barrel, the front of which being a pivot point while the rear screw was originally ground with an eccentric flat at its center. This very different kind of screw was designed so that when it was loosened about one half of a turn, the cylinder catch would then be able to pivot up just far enough to allow the cylinder to be removed from the barrel and when re-tightened, the eccentric part of the screw would pull the cylinder catch back down into its seat on the barrel top-strap.

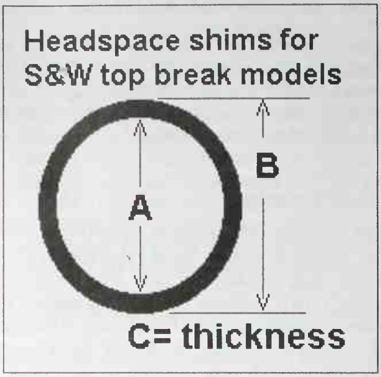
The Schofield doesn't absolutely need this eccentric screw and it will work just fine with a more conventional screw shank; really a duplicate of the front cylinder catch screw, the only thing is the conventional screw would have to be completely removed to allow the cylinder catch to pivot up so the cylinder can be taken off. For the purist and collector however, illustrations of both types are provided. When fabricating a new eccentric screw, cutting the screw slot should be the very last step taken since you would want to try and align the slot vertically. This is to leave room for a witness mark to line up with the mark on the cylinder catch when the screw is tightened.

Headspace, cylinder end-shake repairs and the extractor stud:

We spoke about these earlier, the sort of "two-in-one problem situation" of excess headspace along with too much cylinder end-shake. By way of explanation; for several possible reasons, the cylinder has developed an excess of end-to-end movement which is termed end-shake. In a revolver with this condition the cylinder is being allowed to move farther forward than it should be able to and so in the S&W top-break revolvers the following three situations are occurring:

Number One) The rear face of the cylinder is moved farther forward (in relation to the face of the standing breech) than is normal. In other words the gap or space which exists between the rear of the cylinder and the front of the breech face has increased. This gap or space is called headspace and when it is beyond a fixed limit, we say that the gun has an excess of headspace. With a low pressure cartridge such as we are dealing with here, this increase in headspace probably won't create any safety problems but it does effectively move the cartridge primer farther away from the firing pin; a condition that will lead to misfires and generally unreliable ignition. And *Number Two*) Since the extractor's ratchet teeth have moved forward along with the cylinder, those ratchet teeth have been *moved away from their correct relationship with the hand*, this condition opens the door wide to cylinder timing and indexing problems. And *Number Three*) We have established that the extractor has been allowed to move farther forward than it should be, so then is the extractor stud. The extractor stud is that part that is screwed-in to the center-rear of the extractor which acts as the rear axle for the cylinder by seating into a socket at the rear of the standing breech when the barrel is closed. Since the extractor stud has also been allowed to move forward along with our errant cylinder, this should tell us that the *rear cylinder axle has lost its seat with the frame*, thus creating a condition that may well be allowing unwanted side-to-side movement at the back of the cylinder, movement which might not be there at all if that extractor stud were correctly seated in its socket.

We also spoke earlier about the unique design of the top-break revolver, and of how when we correct the conditions of excess end-shake and headspace, we will be left with whatever large barrel-t- cylinder gap exists. There is no good way to correct this barrel-to-cylinder gap since the barrel is not threaded into a solid frame like it is with more conventional, modern revolvers. Well, we *could* repair only the end-shake and the barrel-to-cylinder gap by machining a new, longer extractor stud which would effectively shove the cylinder forward and hold it there. This would eliminate the barrel-to-cylinder gap, but on the other hand; doing that would also stick us with the bigger problems of excess headspace along with all of the inherent cylinder timing and the poor ignition troubles that will come with the cylinder being too far forward.



Headspace shims, large top-break. For American, Russian, Schofield Models: A-.376", B-.460", C-.010". For New Model No. 3, .44 Double Action models: A-.376", B-.435", C-.101".

Somehow we have to find a workable compromise and the soundest method of compromise is to err on the side of moving the cylinder toward the rear and so *decrease the headspace*. By shoving the cylinder to the rear you will eliminate or at least reduce headspace this will increase ignition reliability. You will be placing the extractor ratchet teeth back into their correct relationship with the hand and so improve timing and indexing, and at the same time you are reestablishing the axle pivot point for the rear of the cylinder. That said, using the drawing in the illustration as your guideline, you can make hardened steel shims that will fit onto the rear end of the base pin. These shims can be used literally, to shove the cylinder permanently toward the rear of the gun. Insert enough shims to bring the headspace measurement down to about .066" -.068". Should you have the need to trim just a bit from the rear of the base pin during this process to get the adjustment just right, the drawing here shows how you can easily make a guide to adapt the Brownell's .540"—90 degree facing cutter so it can be used to neatly trim the rear end of your base pin. Once you have pushed the cylinder rearward so that your headspace measurement has reached the desired point, if the cylinder *still wants to move farther* to the rear, and this would decrease the headspace to the point where there would no be room left for the cartridge rims and so the cylinder would not be able to rotate: stop. At this point we need to remove the extractor stud from the rear of the extractor and then manufacture a new part, identical to the original, only with a longer stud that can later be trimmed to the correct length to hold the headspace distance at our desired specification with little or no front-to-rear movement. An extractor stud removal tool, such as the one shown in the illustration can be made from scratch in the lathe. *Before you attempt to remove* the extractor stud, carefully grasp

the extractor by its shank, across the hexagonal flats in a small, smooth jawed vise, being extra cautious not to over-tighten the vise jaws so you don't collapse the extractor shank. Heat the end of the extractor, in the area around the extractor stud with a propane torch to the point where the old oil and grease which is trapped inside it begins to smoke and to "bubble up" around the outer edge of the extractor stud. Now, while the extractor is still plenty hot, try to turn the extractor stud out by placing the above tool into its spanner cuts, and be sure that you apply at least as much, if not more downward pressure as you do turning force. If the extractor stud still seems to be stuck in place and will not remove without the potential of damaging the extractor, leave the stud right there in the extractor and instead, try the *other repair method* we have shown in the accompanying illustration.

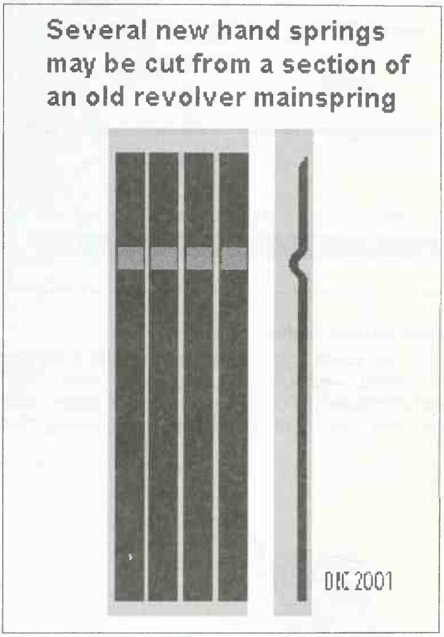
Quick timing: hand repair:

Revolver timing, carry-up, over-carry and under-carry.

Correct revolver timing means that the cylinder needs to be rotated by the hand from the time the cylinder stop releases the cylinder and is mechanically rotated far enough to be locked into position at the next chamber in line by the cylinder stop before the hammer can fall. The term carry-up refers to the hand being able to *carry the cylinder up* to the next chamber at battery position. With over-carry, the hand has carried the cylinder too far past the point where it would be locked into battery by the cylinder stop. The under-carry or failure to carry-up means the hand has not rotated, or *carried* the cylinder far enough for it to be locked into battery by the cylinder stop or bolt.

If you have previously corrected all other looseness, especially of the kinds outlined earlier in this chapter but this gun is still failing to carry-up, then perhaps if we could give the hand just a bit more width it might just be able to finish the carry-up process. Be sure to take the time to read the part in Chapter 4 that covers how *ratchets and hands* operate, from that you will see that since the S&W uses a single stage ratchet system, it will be the *side of the hand* at its top that is pushing on the side of the extractor tooth to finish cylinder rotation or carry-up. The hand's top is active at the beginning of cylinder rotation and stays active for most of the rotation cycle, but this final cylinder indexing is done by the hand's side. By understanding this you can see why a hand that has worn out its opening or *window* in the frame and is a loose fit in that window is laying off to the outside of the cylinder, therefore it is not able to complete cylinder rotation. If your revolver has this sort of a problem, follow the repair procedures that are outlined in Chapter 4 to correct this worn hand window and narrow hand.

On the other side of the coin, there are times when a hand simply needs a little bit more length, as it would when only the tip of the hand had broken off; the kind of breakage that seems to occur in single actions with far more frequency than it does in double actions. Shown in the illustration is an easy method of adding material back onto the hand-top, with this, after preparing a flat at the hand's tip you silver-braze a small piece of flat steel onto the top of the hand. This small steel addition is then shaped into a new hand top by using a small grinding stone and files using a new hand for comparison. But if you don't have a new hand for comparison; just try using the trial-and-error method until you have a hand that will give you good carry-up.

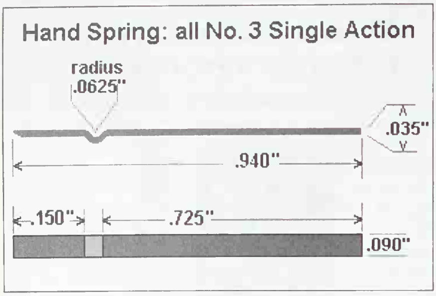


Hand springs, single actions:

Sometimes these flat hand springs are found broken within the hammer, and this is often caused by the spring rusting in half. Most often though, the lack of spring tension may be caused by an accumulation of old gun oils and rust that have hardened into a nasty mass around the spring, so you see it's important not to condemn the spring outright but first take the hammer assembly out of the revolver and try cleaning the entire area around the spring and wetting it with a good penetrating oil.

The hand springs in these are machined from flat spring stock with a tiny "U" shaped notch ground near one end (the spring's thickness remaining constant throughout) through which will pass its retaining pin.

These springs do require fairly strong tension to force the hand to rotate forward by pushing on the small flat cam surface on the hand's shank, so it's not a good idea to try cutting and bending up sheet-spring-stock to make a *quickie* replacement. This sort of spring is best made by grinding it out of strong, and pre-tempered spring stock, such as the flat portion of an old mainspring. By using the plan in the illustration you can see how it is possible to make new single action hand-springs with a small outlay in tools and effort, although some patience will be required.

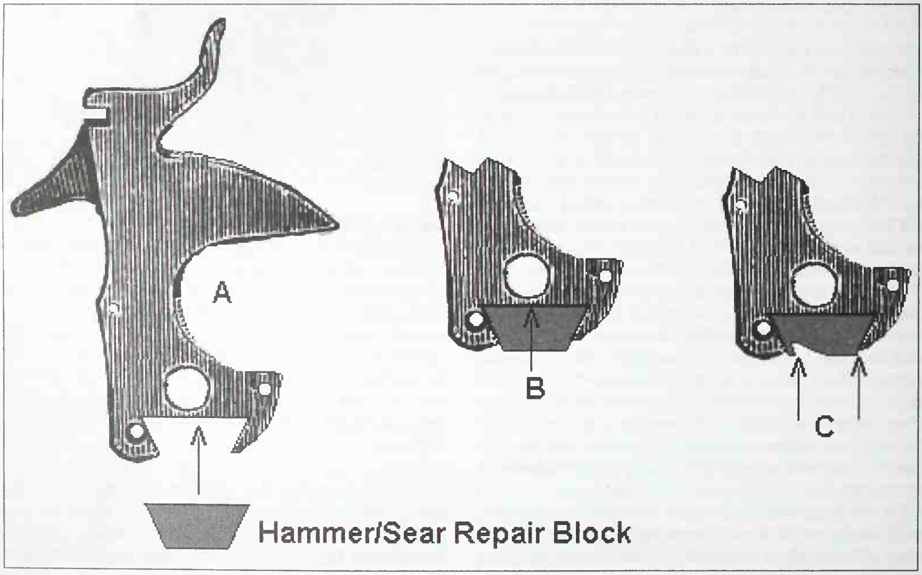


Hand springs, double actions:

Double-action hand-springs are basically a flat type of tapered, and curved spring with small "ball" machined at the top end. These springs are pressed sideways into a nicely machined little corresponding "ball shaped" mill cut near the top/rear of the hand. You can sometimes find new replacement hand springs at the larger gun parts houses such as Numrich Gun Parts Corp. Jack First, Inc., but experience has shown that supplies of these have always been sporadic. Fair replacement springs can be made from thin pieces of flat or "sheet" stamped spring-stock and these may function, for a while anyway. The big trouble with using flat stamped spring-stock is that the new spring can't be held firmly in place by the hand, and that allows it to slide sideways where it can fall out of the hand and may also interfere with the operation of the action. Applying a little patience and some care, a new replacement hand spring can be ground out of a curved piece from an old mainspring, by using a bench grinder and a Dremel or Foredom hand piece to final shape the new spring. Keep in mind that your replacement should fit rather snugly into the machined "recess ball" on the hand, and the thickness of the spring's tapered tail will largely dictate the amount of spring tension that is available; if you leave the tail of the hand too thick it may push the hand too hard into the ratchet and this can interfere with proper trigger return.

Double action stirrup:

Often, the big double actions will be encountered with seemingly ultra-hard trigger pulls, sometimes it feels like there is so much tension being applied by the mainspring that it is not possible to even fully cock the hammer. When you meet up with one of these revolvers, following the take-down instructions for that



model; remove the grips and the sideplate which will allow you to get a good look at the top of the mainspring and at its seat with the hammer stirrup. These double action hammer stirrups like to break off those two little *knobs* on their rear which are supposed to retain the mainspring. When those knobs break off the top of the mainspring then it becomes free to jump up to the point where it ends up pushing directly upon the lower-rear portion of the hammer, this situation creates an un-naturally hard and heavy hammer action. At times, especially if the gun has been used with a broken stirrup for a long period of time, the ears on the mainspring itself, which attach it to the stirrup can be broken off and if that has happened you may be in for a long, hard search to try and find yourself another spring. Should only the stirrup be broken, you can consider yourself very lucky because unlike most parts for Model Number 3 revolvers which are unique and usually difficult to locate, the Model Number 3 .44 double action stirrup is easy to replace: the part is identical to the stirrups used in all the later manufactured Smith & Wesson .38 Hand Ejector—Military and Police and .44 Hand Ejector models made from 1899 through 1945.

1. Smith & Wesson 1857-1945, By Neal and Jinks.
2. Smith & Wesson 1857-1945, By Neal and Jinks.

Smith & Wesson Top Break .44 Single Action Model Number 3: 1st Model American

Disassembly Instructions

1) Lift up on the Barrel Catch #A8, and tilt the revolver barrel all the way down to open the action, exposing the rear of the cylinder's chambers. **Check to be certain the cylinder is unloaded.**

2) To remove the Cylinder #A14: With the barrel all the way open . . . Loosen the Cylinder Catch Screw #A6 several turns you will note that this allows the rear "hook" of the Cylinder Catch #A7 to pivot upwards slightly, releasing the cylinder so it may move rearward. Remove the Cylinder Pin Screw #A5 and the Cylinder #A14 may now be withdrawn off the Base Pin #A47, toward the rear and out of the gun. NOTE: If the Cylinder is simply being removed for cleaning, *do not* change the position of the barrel so that the Ratchet Gear #A19 position is not disturbed, in this way the cylinder may be re-installed in exactly the reverse of the above procedure.

2a) To disassemble the Cylinder: Insert 6 fired cartridge cases *or dummy cartridges* into the chambers. Locate a strong punch that will fit into the hole in the Extractor Rack #A13 and unscrew the rack using the punch as a wrench by turning it counter-clockwise. The Extractor #A15 will push out the rear of the Cylinder. The Extractor Rack Screw #A10 may be unscrewed using a screwdriver and the Extractor Spring #A11 and Collar #A12 will come free with it.

2b) To assemble the cylinder: Reverse the above procedure. To re-install the cylinder in the weapon: Open the barrel all the way, note the position of the gear teeth on the ratchet gear; to install the cylinder correctly the *forward-most tooth of the ratchet gear must be standing straight up* or pointing exactly perpendicular to the bore so that as the cylinder is re-installed, the ***forward tooth on the Extractor Rack will engage with the forward tooth on the Ratchet Gear***. While holding the extractor tightly into the cylinder with your thumb, slide the cylinder assembly forward all the way back into the rear of the base pin until it will not move any farther forward. Once the cylinder is installed correctly, the Cylinder Catch Screw #A6 may be re-tightened.

3) Grips, sideplate and mainspring removal: Remove the Stock Screw #47 and remove the Stocks (grips) #45. Remove the (3) Sideplate Screws #s A40 and A41.Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #A39 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate. Using a pair of "spreader" pliers, pry down on the top-rear of the Mainspring #A38 and disengage it from the Hammer Stirrup #A33. Loosen the Mainspring Strain Screw #A27 and the Mainspring #A38 may be removed through the side of the grip frame #A1.

4) Trigger-guard and hammer removal: Remove the two Guard Screws #A23 and A26 then the Guard #A43 may be pulled down and off the frame. Use care, the Trigger Spring #A25 and Cylinder Stop Spring #A24 are held in place by the Guard and its screws and these springs are now loose. Using a small screwdriver as a lever, pull back on the Hand #A35 so it pivots to the rear, while holding the Hand back, rotate the Hammer #A32 into a position where it will clear the frame opening and lift the Hammer off the Hammer Stud #A42 and out of the frame. Now that the Hammer is out of the gun, the Hand #A35 may be rotated and turned and pulled straight up and out of the Hammer. The Trigger #A30 and Cylinder Stop #A28 are held in place by cross pins which may be drifted out from either side using a suitable pin punch.

5) Barrel Removal: With the barrel opened, remove the Joint Pivot Lock Screw #A22 from the left side of the frame joint. The Joint Pivot #A21 may now be unscrewed and removed from out of the left frame joint. Hold the Ratchet Pawl #A17 to the rear with your thumb, the Barrel #A2 is now free to be lifted up out of the frame joint. Once the barrel is removed, ease off on the Ratchet Pawl #A17 with your thumb and it may be removed out through the front of the frame joint, along with its spring #A18. The Ratchet (gear) #A19 may be removed from the center of the barrel's hinge joint by pulling it downward, make careful note of the ***ratchet gear's position*** for re-assembly. The Ratchet Bushing #A20 (not shown) is at the center of the Ratchet and may be pushed out with finger pressure. The Barrel Catch Screw #A16 is now unscrewed freeing the Barrel Catch # A8 and Barrel Catch Spring #A9 for removal out the rear of the barrel top-strap. If desired, the Cylinder Catch Screw #A6 may be unscrewed, freeing the Cylinder Catch #A7 which may be removed from the bottom of the barrel's top-strap.

6) Hammer disassembly: Rotate the Hand #A35, 180 degrees and pull it out the left side of the Hammer. Drift out the handspring pin (#A37) located at the center-front of the Hammer which holds in the Handspring #A36, the Handspring now may be slid forward out of its recess in the hammer. The Hammer Stirrup #A33 may be removed by drifting out its pin (#A34) at the rear of the Hammer. NOTE the orientation of the Stirrup #A33 for re-assembly.

Re-assemble components in reverse order of disassembly, paying special attention to **note 1b** above.

Smith & Wesson Top Break .44 Single Action Model Number 3: American 2nd — 3rd Models and 1st— 2nd Model Russian

Disassembly Instructions

1) Lift up on the Barrel Catch #A8, and tilt the revolver barrel all the way down to open the action, exposing the rear of the cylinder's chambers. **Check to be certain the cylinder is unloaded.**

2) To remove the Cylinder #A14: With the barrel all the way open . . . Loosen the Cylinder Catch Screw #A6 several turns. Remove the Cylinder Pin Screw #A5 and pull the Cylinder #A14 slightly to the rear (about 1/4") then push it back forward, the Cylinder Catch #A7 will have moved rearward 1/4" and may now be withdrawn by pulling it out the rear of the barrel. The Cylinder #A14 may now be withdrawn off the Base Pin #A47, toward the rear and out of the gun. NOTE: If the Cylinder is simply being removed for cleaning, *do not* change the position of the barrel so that the Ratchet Gear #A19 position is not disturbed, in this way the cylinder may be re-installed in exactly the reverse of the above procedure.

2a) To disassemble the Cylinder: Insert six fired cartridge cases *or dummy cartridges* into the chambers. Locate a strong punch that will fit into the hole in the Extractor Rack #A13 and unscrew the rack using the punch as a wrench by turning it counter-clockwise. The Extractor #A15 will push out the rear of the Cylinder. The Extractor Rack Screw #A10 may be unscrewed using a screwdriver and the Extractor Spring #A11 and Collar #A12 will come free with it.

2b) To assemble the cylinder: *Reverse the above procedure*. To re-install the cylinder in the weapon: Open the barrel all the way, note the position of the gear teeth on the ratchet gear; to install the cylinder correctly the *forward-most tooth of the ratchet gear must be standing straight up* and perpendicular to the bore so that as the cylinder is re-installed, the ***forward tooth on the Extractor Rack will engage with the forward tooth on the Ratchet Gear.*** While holding the extractor tightly into the cylinder with your thumb, slide the cylinder assembly forward all the way back into the rear of the base pin until it will not move any farther forward. Once the cylinder is installed correctly, the Cylinder Catch #A7 may be slid into place in the barrel top-strap and the Cylinder Catch Screw #A6 may be re-tightened.

3) Grips, sideplate and mainspring removal: Remove the Stock Screw #47 and remove the Stocks (grips) #45. Remove the (3) Sideplate Screws #s A40 and A41.Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #A39 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate. Using a pair of "spreader" pliers, pry down on the top-rear of the Mainspring #A38 and disengage it from the Hammer Stirrup #A33. Loosen the Mainspring Strain Screw #A27 and the Mainspring #A38 may be removed through the side of the grip frame #A1.

4) Trigger-guard and hammer removal: Remove the two Guard Screws #A23 and A26 then the Guard #A43 may be pulled down and off the frame. Use care, the Trigger Spring #A25 and Cylinder Stop Spring #A24 are held in place by the Guard and its screws and these springs are now loose. Using a small screwdriver as a lever, pull back on the Hand #A35 so it pivots to the rear, while holding the Hand back, rotate the Hammer #A32 into a position where it will clear the frame opening and lift the Hammer off the Hammer Stud #A42 and out of the frame. Now that the Hammer is out of the gun, the Hand #A35 may be rotated turn and pulled straight up and out of the Hammer. The Trigger #A30 and Cylinder Stop #A28 are held in place by cross pins which may be drifted out from either side using a suitable pin punch.

5) Barrel Removal: Remove the Joint Pivot Screw #A21a from the right side of the frame joint. Remove the Joint Pivot Lock Screw #A22 from the left side of the frame joint. The Joint Pivot #A21 may be pushed out of the frame joint from right to left, using a pin punch. Hold the Ratchet Pawl #A17 to the rear with a thumb, the Barrel #A2 is now free to be lifted up out of the frame joint. When the Barrel is removed, ease off on the Ratchet Pawl with your thumb and it may be removed from the front of the frame joint, along with its spring #A18. The Ratchet (gear) #A19 may be removed from the barrel joint by pulling it downward> make note of it's position for re-assembly. The Ratchet Bushing #A20 (not shown) is at the center of the Ratchet and may be pushed out with finger pressure. The Barrel Catch Screw #A16 is now unscrewed freeing the Barrel Catch # A8 and Barrel Catch Spring #A9 for removal out the rear of the barrel top-strap.

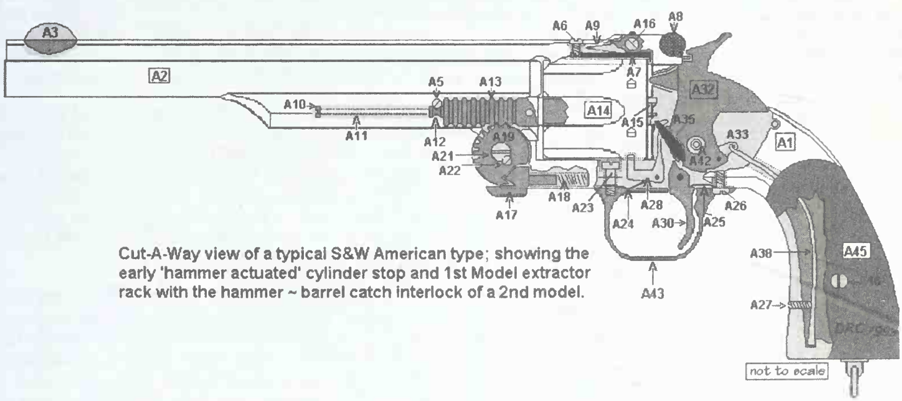
6) Hammer disassembly: Rotate the Hand #A35, 180 degrees and pull it out the left side of the Hammer. Drift out the handspring pin (#A37) located at the center-front of the Hammer which holds in the Handspring #A36, the Handspring now may be slid forward out of its recess in the hammer. The Hammer Stirrup #A33 may be removed by drifting out its pin (#A34) at the rear of the Hammer. NOTE the position of the Stirrup #A33 for re-assembly.

Re-assemble components in reverse order of disassembly, paying special attention to **note 1b** above.

Notes: Two types of *cylinder stops* may be found, the *Hammer Actuated* type (*illustrated on the left of the drawing*) is found on 1st and 2nd model Americans and on a very few 1st Model Russian revolvers. The *Trigger Actuated* type (*illustrated on the right of the drawing*) of cylinder stop is found on later 2nd and 3rd Model Americans, on most 1st model and all on 2nd model Russians. There are differences in the Triggers used with both stop types, the later stop has a shoulder on its front — above the finger piece which actuates the stop and also uses a more pointed tip on the finger piece, the early stop models do not have this shoulder on the trigger and have a squared tip on the finger piece. The diameter of the Trigger Pin #A31 was also increased and the frame around the trigger pin was reinforced on all Models Number 3 after the First Model American.

.44 American and Russian 1st & 2nd Models parts nomenclature

A1) Frame
A2) Barrel
A3) Front Sight
A4) Front Sight Pin
A5) Cylinder Pin Screw
A6) Cylinder Catch Screw
A7) Cylinder Catch
A8) Barrel Catch
A9) Barrel Catch Spring
A10) Rack Screw
A11) Extractor Spring
A12 Extractor Collar
A13) Extractor Rack
A14) Cylinder
A15) Extractor
A16) Barrel Catch Screw
A17) Ratchet Pawl
A18) Ratchet Pawl Spring
A19) Ratchet (gear)
A20) Ratchet Bushing (not shown)
A21) Joint Pivot
A21a) Joint Pivot Screw (not shown)
A22) Joint Pivot Lock Screw
A23) Guard Screw, front
A24) Cylinder Stop Spring
A25) Trigger Spring
A26) Guard Screw, rear
A27) Strain Screw
A28) Cylinder Stop
A29) Stop Pin
A30) Trigger
A31) Trigger Pin
A32) Hammer
A33) Hammer Stirrup
A34) Stirrup Pin
A35) Hand
A36) Hand Spring (not shown)
A37) Hand Spring Pin
A38) Mainspring
A39) Sideplate
A40) Sideplate Screw, center
A41) Sideplate Screw, front or rear
A42) Hammer Stud
A43) Trigger-Guard
A44) Stock Pin (not shown)
A45) Stocks (grips)
A46) Stock Screw
A47) Base Pin (not shown)



Cut-A-Way view of a typical S&W American type; showing the early 'hammer actuated' cylinder stop and 1st Model extractor rack with the hammer ~ barrel catch interlock of a 2nd model.

Smith & Wesson Top Break .44 Single Action Third Model/ New Model Russian

Disassembly Instructions

1) Lift up on the Barrel Catch #R8, and tilt the revolver barrel all the way down to open the action, exposing the rear of the cylinder's chambers. **Check to be certain the cylinder is unloaded.**

2) Cylinder removal: To remove the Cylinder #R14: with the barrel opened all the way: Loosen the Cylinder Catch Screw #R6 located in the barrel top strap. Depress the front of the Extractor Rack Catch #R10a and pull the Cylinder #R14 to the rear, the cylinder will withdraw off the Base Pin #R47, toward the rear. **Note:** the Cylinder Catch #R7 will withdraw along with, and will be partially removed by the action of removing the cylinder. To completely remove the Cylinder Catch #R7, simply pull it to the rear, pay attention to this part so that it may be re-installed properly after the cylinder is installed.

3) Barrel removal: Remove the Joint Pivot Screw #R21a from the left side of the hinge on the Frame #R1, and use an appropriate straight punch to drive the Joint Pivot #R21 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #R2 is now loose and may be lifted up out of its joint with the frame. The Extractor Gear #R19 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make careful note of the Extractor Gear #R19's position for re-assembly.

4) Grips and sideplate removal: Remove the Stock Screw #R46 and the Stocks #s R45-R & R45-L. Remove the two long Sideplate Screws #s R41 and the center Sideplate Screw #R40. Turn the frame on its side holding it by the hinge, sideplate facing up, over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #R39 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

5) Mainspring and hammer removal: Use a pair of "spreader" pliers to compress the top of the Mainspring #R38 so the hammer Stirrup #R33 may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #R27; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #R38 from the frame side. Carefully rotate the top of the Hand #R35 to the rear using a small screwdriver as a lever, and while holding the Hand to the rear; pull the Trigger #R30 and hold it to the rear. The Hammer #R32 may be rotated about way back and carefully pulled upwards, off of its Hammer Stud #R42, and out of the frame.

6) Trigger-guard removal: Remove the Trigger-Guard Screw #R23 (located on the inside, frame bottom). Pull down on the front of the Trigger-Guard #R43, and the pull forward to disengage the lip at the rear of the guard from the frame. Remove it and the Cylinder Stop Spring #R24 as an assembly, noting their position for re-assembly.

7) Cylinder stop and trigger removal: Drift out the Cylinder Stop Pin (the center of the three pins that pass through the frame from side-to-side) and push the Cylinder Stop #R28 out toward the bottom, using a small punch through its window in the frame, under the area where the cylinder rotates. Drift out the Trigger Pin (the rear-most of the three pins that pass through the frame from side to side). The Trigger #R30 may be pulled out the bottom of the frame. The Trigger Spring #R30a is held into the frame by a pin which passes through the front grip strap. Remove this pin and the Trigger Spring #R30a will lift out of its seat in the frame.

8) Cylinder disassembly: Insert six fired cartridge cases *or dummy cartridges* into the chambers for support. Grasp the Extractor Ratchet #R13 on its *flats* with a suitable spanner wrench and rotate the Cylinder #R14 in a counter-clockwise direction to unscrew the Extractor Ratchet #R13 from the Extractor #R15. Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this should be aligned with the serial numbers on the cylinder for re-assembly. The Extractor Rack Screw #R10, and its Nut #R10a are a riveted assembly, held captive with the Extractor Rack spring #R11 inside the Extractor Rack #R13, further disassembly is not recommended.

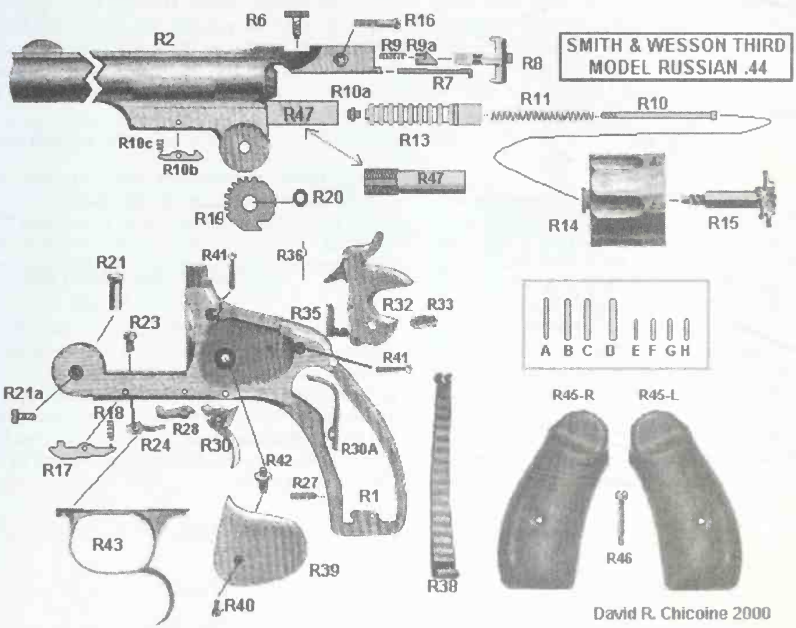
9) Hammer disassembly: Rotate the Hand #R35, 180-degrees and pull it up, out of the Hammer. Drift out the pin in the center-front of the Hammer which holds in the Handspring #R36, the Handspring now may be slid up and out of its recess in the hammer. The Hammer Stirrup #R33 may be removed by drifting out its pin at the rear of the Hammer. NOTE the orientation of the Stirrup #R33 for re-assembly.

10) Barrel disassembly: Remove the Barrel Catch Screw #R16 from the left side of the Barrel top-strap, the Barrel Catch #R8 may be withdrawn to the rear. By holding the Barrel #R2 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a wooden bench-top, the Barrel Catch Cam #R9a and Barrel Catch Cam Spring #R9 will fall out of their recess in the top-strap. Note their positions for re-assembly.

Re-assemble the revolver in the reverse order of the above, paying special attention as you do to the relationships of the *GEAR TEETH* on the Extractor Rack and the Extractor Gear. To install the cylinder correctly the *forward-most tooth of the ratchet gear must be standing straight up* and perpendicular to the bore so that as the cylinder is re-installed, the ***forward tooth on the Extractor Rack will engage with the forward tooth on the Ratchet Gear.***

.44 Russian 3rd Model parts nomenclature

R1) Frame
R2) Barrel
R6) Cylinder Catch Screw
R7) Cylinder Catch
R8) Barrel Catch
R9) Barrel Catch Spring
R9a) Barrel Catch Cam
R10) Extractor Rack Screw
R10a) Extractor Rack Screw Nut
R10b) Extractor Catch
R10c) Extractor Catch Spring
R11) Extractor Spring
R13) Extractor Rack
R14) Cylinder
R15) Extractor
R16) Barrel Catch Screw
R17) Ratchet Pawl
R18) Ratchet Pawl Spring
R19) Ratchet (gear)
R20) Ratchet Bushing
R21) Joint Pivot
R21a) Joint Pivot Screw
R23) Guard Screw
R24) Cylinder Stop Spring
R27) Strain Screw
R28) Cylinder Stop
R30) Trigger
R30a) Trigger Spring
R32) Hammer
R33) Hammer Stirrup
R35) Hand
R36) Hand Spring
R38) Mainspring
R39) Sideplate
R40) Sideplate Screw, center
R41) Sideplate Screw, front or rear
R42) Hammer Stud
R43) Trigger-Guard
R45) L&R Stocks (grips)
R46) Stock Screw
R47) Base Pin
A) Cylinder Stop Pin
B) Trigger Pin
C) Ratchet Pawl Pin
D) Stock Pin
E) Hand Spring Pin
F) Stirrup Pin
G) Trigger Spring Pin
H) Extractor Catch Pin



Smith & Wesson Model No. 3 Schofield

Disassembly Instructions

1) Pull back on the Barrel Catch #876, and tilt the revolver barrel all the way down to open the action, exposing the rear of the cylinder's chambers. **Check to be certain the cylinder is unloaded.**

2) Cylinder Removal: To remove the Cylinder #883: Loosen the rear screw (#907) in the Cylinder Catch #905 about a half turn. Loosen the front screw on the Cylinder Catch and tilt the Cylinder Catch up slightly then pull the Cylinder #883 to the rear. The rear cylinder catch screw # 907, is supposed to have an *eccentric screw shank* which will allow the Cylinder Catch #905 to be tilted up slightly when it is loosened. Over the years the screw may have been changed for a screw with a plain shank, in which case you will have to remove the rear screw in order to tilt the Cylinder Catch up to allow the cylinder to be removed. The cylinder will now withdraw off the Base Pin #879, toward the rear.

3) Barrel removal: Remove the Joint Pivot Screw #899 from the left side of the hinge on the Frame #920, and use an appropriate straight punch to drive the Joint Pivot #898 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #875 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #886 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its orientation for re-assembly.

4) Grips and sideplate removal: Remove the Grip Screw #916 and the Grips #s 914. Remove the Barrel Catch screw #877. Bring the hammer back to the cock position and withdraw the Barrel Catch #876 from the top. Remove the two Sideplate Screws #s 902 & 903. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #901 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

5) Mainspring and hammer removal: Use a pair of "spreader" type pliers to compress the top of the Mainspring #900 so the hammer Stirrup #893 may be rotated forward and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #917; located in the bottom-front of the front grip strap on the frame and withdraw the Mainspring #900 out from the frame side. Carefully rotate the top of the Hand #895 to the rear using a small screwdriver as a lever and while holding the Hand to the rear; pull the Trigger #908 and hold it to the rear. The Hammer #891 may be rotated about half way back and carefully pulled upwards, off of its Hammer Stud #892, and out of the frame.

6) Trigger-guard removal: Remove the Trigger-Guard Screw #913 and remove the Guard #912 by pulling down on its front. The Cylinder Stop Spring #881 is fitted into, and held captive by a small dovetail slot inside the guard.

7) Cylinder stop and trigger removal: Drift out the Cylinder Stop Pin (the forward-most of the two pins that pass through the frame from side-to-side) and push the Cylinder Stop #880 out toward the bottom, using a small punch through its window in the frame, under the area where the cylinder rotates. Drift out the Trigger Pin (the rear-most of the two pins that pass through the frame from side to side). The Trigger #908 may be pulled out the bottom of the frame. The Trigger Spring #910 is mounted inside the front grip strap and is held in place by a cross-pin running through the grip frame.

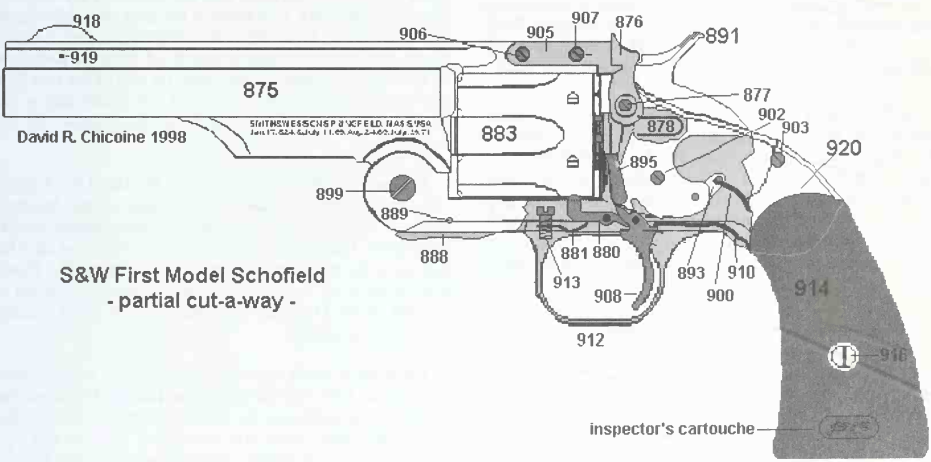
8) Cylinder disassembly: Insert six fired cartridge cases *or dummy cartridges* into the chambers for support. Push a punch through the hole in the Ejector Rod #885 and rotate the Cylinder #883 in a counter-clockwise direction to unscrew the Ejector Rod #885 from the Extractor #884.

9) Hammer disassembly: Rotate the Hand #895, 180 degrees and pull it out the left side of the Hammer. Drift out the pin in the center-front of the Hammer which holds in the Handspring #896, the Handspring now may be slid forward up and out of its recess in the hammer. The Hammer Stirrup #893 may be removed by drifting out its pin at the rear of the Hammer. NOTE the position of the Stirrup #893 for re-assembly.

Re-assemble the revolver in the reverse order of above.

Parts for Smith & Wesson Schofield

875) Barrel
876) Barrel Catch
877) Barrel Catch Screw
878) Barrel Catch Spring
879) Base Pin
880) Cylinder Stop New
881) Cylinder Stop Spring
882) Cylinder Stop Pin
883) Cylinder
884) Extractor
885) Extractor Rod
885a)Extractor Stud
886) Extractor Cam
886a)Extractor Cam Bushing
887) Extractor Spring
888) Extractor Pawl
889) Extractor Pawl Pin
890) Extractor Pawl Spring
891) Hammer
892) Hammer Stud
893) Hammer Stirrup
894) Hammer Stirrup Pin
895) Hand
896) Hand Spring
897) Hand Spring Pin
898) Joint Pivot
899) Joint Pivot Screw
900) Mainspring
901) Sideplate
902) Sideplate Screw, Center
903) Sideplate Screw, Rear
905) Top Strap(Cylinder Catch)
906) Top Strap Screw, Front
907) Top Strap Screw, Eccentric, rear
908) Trigger
909) Trigger Pin,
910) Trigger Spring
911) Trigger Spring Pin
912) Trigger-Guard
913) Trigger-Guard Screw
914) Grips (stocks)
915) Grip Pin
916) Grip Screw
917) Strain Screw
918) Front Sight
919) Sight Pin
920) FRAME



S&W First Model Schofield
- partial cut-a-way -

Smith & Wesson Top Break .44 Single Action, New Model No. 3

Including: 32-44 and 38-44 Target, New Model No. 3 Frontier, .320 Revolving Rifle.
Disassembly Instructions

1) Lift up on the Barrel Catch #249, and tilt the revolver barrel all the way down to open the action. **Check to be certain the cylinder is unloaded.**

2) **Cylinder removal:** To remove the Cylinder #245: Hold the Barrel Catch #249 in the UP position and pull the Cylinder #245 to the rear while you are rotating it in a counter-clockwise direction. The cylinder will withdraw off the Base Pin #248 toward the rear.

3) **Barrel removal:** With the barrel opened, remove the Joint Pivot Screw #254a, from the left side of the hinge on the Frame #242, and use an appropriate straight punch to drive the Joint Pivot #254 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and of its corresponding witness mark on the frame for re-assembly. The Barrel #241 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #250 is located between the "ears" of the barrel hinge and may be pulled straight down and out of the barrel hinge. Make note of the Extractor Cam's position for re-assembly. Special note: some early New Models will be found with a type of rack and gear extractor. The Extractor rack is a separate part that will remove out the rear of the base pin. To install the cylinder correctly in these guns be sure the *forward-most tooth of the ratchet gear is standing straight up* and perpendicular to the bore so that as the Extractor Rack is re-installed, the ***forward tooth on the Extractor Rack will engage with the forward tooth on the Ratchet Gear***.

4) **Grips and sideplate removal:** Remove the Stock Screw #260 and the Stocks (grips) #s 256 & 257. Remove the three Sideplate Screws #s 262 (1 each) & #263 (2 each). Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #244 to jump up out of its seat in the frame for removal. **NEVER attempt to pry off the sideplate.**

5) **Mainspring and hammer removal:** Use a pair of "spreader" pliers to compress the top of the Mainspring #273 in the area just to the rear of its junction with the Hammer Stirrup #267, so that the Hammer Stirrup #267 may be rotated forward and out of its seat between the two "ears" at the top of the mainspring. Loosen the Strain Screw #259; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #273 from the left frame side. Carefully rotate the top of the Hand #252 to the rear, at first using a small screwdriver as a lever, and while holding the Hand #252 to the rear; pull the Trigger #247 and also hold it to the rear. The Hammer #243 may now be rotated about 1/2 way back and carefully pulled upwards, off of its Hammer Stud #268 and out of the frame through the sideplate opening.

6) **Trigger-guard removal:** Remove the Trigger-Guard Screw #264 (located facing up, on the frame; inside the bottom of the cylinder cut and viewed with the barrel open). Hold the frame upside down by the grip, and the Trigger-Guard #246 may be pulled down and forward by its front, out of its seat with the frame. Note; the *machined lip* at the rear of the Trigger-Guard which fits into a machined recess in the frame so that no rear guard screw is required. The Cylinder Stop Spring #269 is fitted into, and held captive by a small dovetail slot inside the guard.

7) **Trigger and stop removal:** Drift out the Cylinder Stop Pin (the forward-most of the two pins that pass through the frame from side to side) and push the Cylinder Stop #253 out toward the bottom, using a small punch through its window in the frame, directly under the area where the cylinder rotates. Drift out the Trigger Pin (the rear-most of the two pins that pass through the frame from side to side). The Trigger #247 may now be pulled out the bottom of the frame. The Trigger Spring #271 is mounted inside the front grip-strap and is held in place by a small cross-pin that runs through the grip frame from side to side.

8) **Cylinder disassembly:** Insert six fired cartridge cases *or dummy cartridges* into the chambers for support. Grasp the Extractor Rod #258 in the jaws of a drill chuck and rotate the Cylinder #245 in a counter-clockwise direction to unscrew the Extractor Rod #258 from the Extractor #255. Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this dot is intended to be aligned with the serial numbers on the cylinder for re-assembly.

9) **Hammer disassembly:** Rotate the Hand #252 about 180 degrees and pull it out of the left side of the Hammer. Drift out the pin in the center-front of the Hammer which holds in the Handspring #270, the Handspring now may be slid out of its recess in the front of the hammer. The Hammer Stirrup #267 may be removed by drifting out its pin at the rear of the Hammer. Note the position of the Stirrup #267 for re-assembly.

10) **Barrel catch removal:** Remove the Barrel Catch Screw #261 from the left side of the Barrel's top-strap, the Barrel Catch #249 may be withdrawn out to the rear. By holding the Barrel #241 in a 'muzzle up' position and tapping the rear of the barrel's top-strap on a wooden bench-top, the Barrel Catch Cam #251 and Barrel Catch Cam Spring #265 will fall out of their recess in the top-strap. Note the positions of these two parts carefully for re-assembly.

Special notes, New Model No. 3 Target and 320 Rifle: New Model No. 3 target barrel catches are made in two main pieces, the center portion being moveable in

order to allow for a limited elevation adjustment. Windage adjustments are accomplished by loosening the two tiny screws at the rear of the barrel catch, then sliding the sight's slide to either side. Target barrel catches are removed in exactly the same manner as above. Standard production New Model No. 3 revolvers use a special hammer stirrup which causes the hammer to rebound slightly. Target New Models No. 3 use a standard, non-rebounding hammer stirrup.

The 320 Revolving Rifle uses a special hammer which is equipped with a fly in addition to a special trigger that is modified to work with the hammer fly.

Re-assemble the revolver in the reverse order of above.

Smith & Wesson New Model #3

241) Barrel
242) Frame
243) Hammer
244) Sideplate
245) Cylinder
246) Trigger-Guard
247) Trigger
248) Base Pin
249) Barrel Catch
250) Extractor Cam, pivoted pawl
250a) Extractor Cam, slide bar
251) Barrel Catch Cam
252) Hand
253) Cylinder Stop
254) Joint Pivot
254a)Joint Pivot Screw
255) Extractor
256 &257)Stocks (grips)
258) Extractor Rod
259) Strain Screw
260) Stock Screw
261) Barrel Catch Screw
262) Sideplate Screw, Long
263) Sideplate Screw, Short
264) Trigger-Guard Screw
265) Barrel Catch Cam Spring
266) Front Sight
267) Stirrup, rebounding
267) Stirrup, non-rebounding, target
268) Hammer Stud
269) Cylinder Stop Spring
270) Hand Spring
271) Trigger Spring
272) Extractor Spring
273) Mainspring
A) Stock(grip)Pin
B) Trigger Pin
C) Cylinder Stop Pin
D) Stirrup Pin
E) Handspring Pin
F) Front Sight Pin
G) Trigger Spring Pin

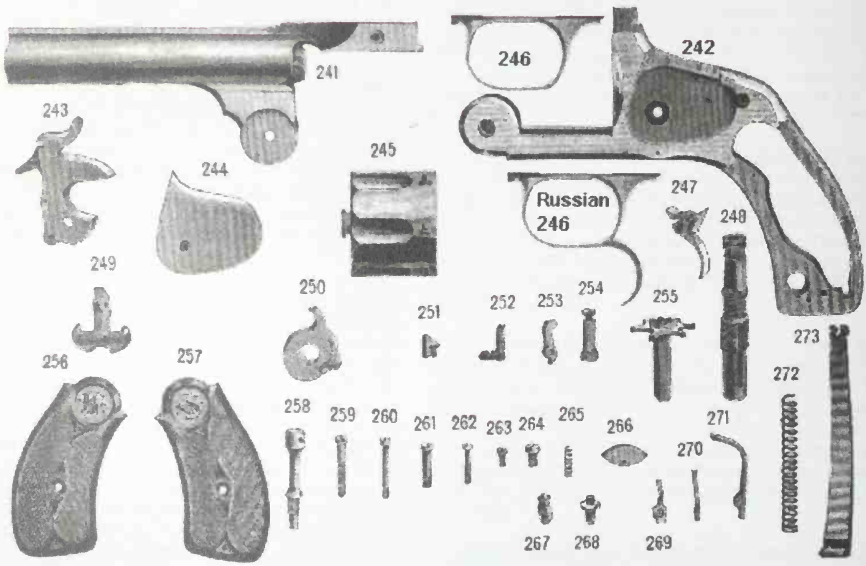
NOTES:

*Standard N.M.#3 has 1&7/16" long Cylinder.

*Frontier N.M.#3 has 1&9/16" long cylinder.

*.44 D. A. barrels will fit New Model #3, patent dates differ.

*32/44 & 38/44s and .44 Target models use the non-rebounding hammer stirrup.



Smith & Wesson Top Break .44 Double Action Models

Including: .38/40 & .44/40 Double Action Frontier, .44 Wesson Favorite

Disassembly Instructions

1) Lift up on the Barrel Catch #279, and tilt the revolver barrel all the way down to open the action. **Check to be certain the cylinder is unloaded.**

2) Cylinder Removal: To remove the Cylinder #275, hold the Barrel Catch #279 in the up position and pull the Cylinder #275 to the rear while turning it in a counter-clockwise direction. The cylinder will withdraw off the Base Pin #283, toward the rear.

3) Barrel Removal: With the barrel still in the open position, remove the Joint Pivot Screw #290a, from the left side of the hinge on the Frame #242, and use an appropriate straight pin punch to drive the Joint Pivot #290 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and of its corresponding witness mark on the frame for later re-assembly. The Barrel #274 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #278 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly.

4) Grips, sideplate and mainspring removal: Remove the Stock Screw #292 and the Stocks #s 295 & 296. Remove the Hammer Stud Nut # 294; this part acts as the sideplate screw. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame one or more sharp blows using a plastic or hardwood mallet, this will cause the Sideplate #276 to jump up out of its seat in the frame for removal. Never attempt to pry off the sideplate. Use a pair of "spreader" pliers to compress the top of the Mainspring #302 so the Hammer Stirrup #307b may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #291; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #302 from the frame side.

5) Trigger- Guard Removal: The Trigger-Guard #282 is a spring, it has no fastening screws and it is held in place by machined tabs at its front and rear tops which mate with machined mortice cuts in the frame. Hold the frame upside down by the grip, and tap the REAR face of the Trigger-Guard #282 with a plastic mallet, causing the rear of the Guard to "jump" out of its seat in the frame. Pull the Trigger #281 all the way to the rear, the Guard may now be moved rearward slightly to disengage its front tab from the frame, tilt the front of the Guard down and push forward to remove. The Trigger Spring #306 will remove with the guard, make note of its position for reassembly.

6) Action disassembly: Pull the Trigger #281 to the rear and hold it all the way to the rear. The Hammer #280 may now be rotated partially to the rear and carefully worked up off its Stud #289 and out of the frame. As you release the Trigger, make note of the Rear Sear #287: it is under spring tension and will rotate down on its own as the trigger moves forward. Drift out the retaining pin for the Rear Sear Spring #307 and remove the spring. Next, drift out the Rear Sear Pin (the rearmost of the two large pins which pass through the frame) and remove the Rear Sear #287, noting its position for reassembly. Drift out the Trigger Pin (the forward most of the two large pins which pass through the frame). Push the Trigger assembly up and to the rear slightly, until the entire face of the Hand #284 is exposed in the sideplate opening. Grasp the Hand #284 and its spring #305 with a small pair of needle nosed pliers and pull the hand assembly straight up and out of the frame. The Trigger #281 may be removed through the bottom of the frame while the Front Sear #285 may be removed through the sideplate opening. Note the relationship of the Trigger assembly (#281 Trigger, #285 Rear Sear, #284 Hand) for re-assembly later.

7) The Trigger and Cylinder Stop: The Cylinder Stop #286 is mounted in the top-center of the Trigger #281. Under the Cylinder Stop is a small plunger and coil spring which power the Cylinder Stop. The *spring and plunger will be under tension during trigger removal*, use care when removing the trigger so that these two small parts are not lost.

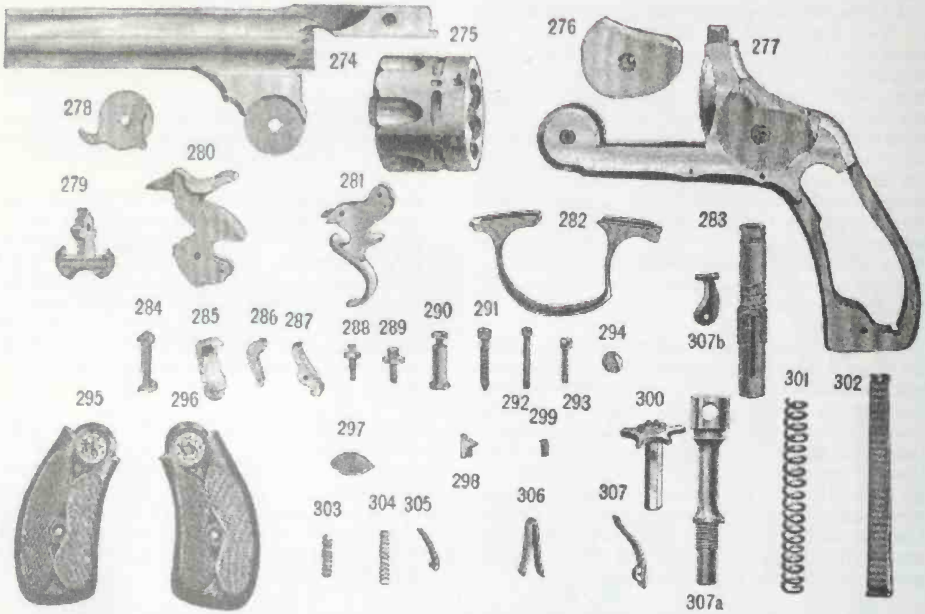
8) Cylinder disassembly: *Insert six fired cartridge cases or dummy cartridges into the chambers for support.* The Extractor Rod #307a has a small hole through its head. Insert an appropriately sized pin punch in the jaws of a drill chuck and rotate the Cylinder #275 in a counter-clockwise direction to unscrew the Extractor Rod #307a from the Extractor #300. Note the witness mark "dot" on one of the rear facing legs of the Extractor 'star', this mark should be aligned with the serial numbers on the cylinder for re-assembly.

9) Barrel Catch Removal: Remove the Barrel Catch Screw #293 from the left side of the Barrel top-strap, the Barrel Catch #279 may be withdrawn to the rear. By holding the Barrel #274 in a 'muzzle up' position and tapping the rear of the barrel top-strap on a soft wooden bench-top, the Barrel Catch Cam #298 and Barrel Catch Cam Spring #303 will fall out of their recess in the top-strap. Note their positions for re-assembly.

Reassemble the action in ***EXACTLY*** the reverse of the order given above.

Parts Nomenclature: S&W .44 Double Action Models

274) Barrel
275) Cylinder
276) Sideplate
277) Frame
278) Extractor Cam
279) Barrel Catch
280) Hammer
281) Trigger
282) Trigger-Guard
283) Base Pin
284) Hand
285) Front Sear
286) Cylinder Stop
287) Rear Sear
288) Extractor Stud
289) Hammer Stud
290) Joint Pivot
290a) Joint Pivot Screw
291) Strain Screw
292) Stock Screw
293) Barrel Catch Screw
294) Hammer Stud Nut
295 & 296)Stocks
297) Front Sight
298) Barrel Catch Cam
299) Cylinder Stop Plunger
300) Extractor
301) Extractor Spring
302) Mainspring
303) Barrel Catch Cam Spring
304) Cylinder Stop Spring
305) Handspring
306) Trigger Spring
307) Rear Sear Spring
307a) Extractor Rod
307b) Stirrup



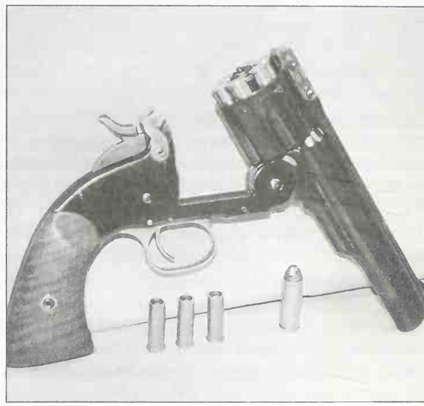
Smith & Wesson replicas

Repair and troubleshooting original and replica revolvers.

Cimarron Firearms/Armi San Marco manufactured Schofields: S&W top-break copies were imported by Cimarron Firearms of Fredericksburg, Texas. These were replicas of the First Model Schofield, and were originally made exclusively for Cimarron by Armi San Marco of Italy. Some of the early versions this author examined were extremely faithful copies of the S&W Schofield, the exceptions being the longer cylinder and the addition of a hammer block safety. This safety mechanism required internal changes to the frame, trigger-guard, trigger, trigger spring and hammer. Outwardly, other than the alterations made to allow the gun to accept the .45 Colt cartridge, Cimarron's name and address in place of Smith & Wesson's, and the ".45 Colt" caliber marking on the side of the barrel, the Cimarron revolvers were very close copies of the original. Dimensional comparisons between original S&W Schofields against an early Cimarron import shows compatibility in almost all the areas we measured, except the screws which were used crudely formed metric pitch threads. Even the barrel's rifling on the early revolvers was identical to Smith & Wesson's with five right-hand twist lands and grooves. This was soon changed to six lands and grooves formed with modern button rifling equipment. This author had the opportunity of extensively testing quite a few of the early Cimarron Schofields and for the most part, the test guns acted very well, giving very good overall accuracy and fair to good dependability despite some mechanical difficulties.

This first replica of the S&W Schofield came from the ideas of Mike Harvey, the owner and founder of Cimarron Firearms. Mike had enlisted the assistance of the Smith & Wesson company historian, Roy G. Jinks at the beginning of the project and Roy supplied many original company documents and sample parts. Harvey supplied an original S&W Schofield revolver; all of which were sent to Armi San Marco in Italy for use as patterns. The author became involved with the Cimarron Schofield project in 1996, soon after the first sample guns arrived in this country. At the request of Mike Harvey, I was asked to examine and evaluate a couple of these revolvers (I later examined many more) and make suggestions as to how certain mechanical problems that had appeared in them might best be resolved.

On first impression these early A.S.M. built Schofields were outwardly wonderful copies of the original revolvers, nearly perfect in both line and form. It appeared that at long last there would be a good, shootable replica of the S&W Schofield on the market that actually looked like the real thing. Externally the polish, blue and case colors were not up to 19th century Smith & Wesson work, but their work wasn't bad either, in fact by late 20th century standards it was more than acceptable. The troubles in these early guns were not usually with the finish, but were more of a mechanical nature. Cimarron had initially asked me to explain why some of these guns unlocked at the barrel catch and opened during firing, an occurrence with dangerous potential that Cimarron's owner understandably, was very concerned about, he wanted those problems cured, quickly and for good. Some of the other complaints reported were off-center primer strikes, lead spitting from the barrel-cylinder gap, a very stiff barrel catch operation, and looseness in the barrel at the barrel catch. Each gun didn't have all these symptoms, but many had at least some of them.



The 5" barreled version of the Cimarron Schofield manufactured by A.S.M. in Italy. This particular gun was converted by the author to shoot black powder .38 Colt and .38 Special. Diana Boone photography. Bullet 'N Press photo.

A closer examination showed us several reasons for these problems, all of which were obvious manufacturing errors, and they quickly turned out to be much more extensive than they had originally appeared. All of my findings were put into a set of carefully prepared reports that Cimarron forwarded to Armi San Marco for immediate attention. Months went by and the problems, which at first seemed to have been corrected by the factory, returned with, unfortunately still more, and different maladies. Cimarron at that point requested me to write a detailed, step-by-step manual for the A.S.M. factory assemblers to follow, and to give Cimarron's own repair staff the knowledge to repair similar problems that might come to their attention. For reasons

unknown to this author or to Cimarron, even with the reports, the assembly manual and an original Smith & Wesson revolver in hand, the A.S.M. factory was never able to satisfactorily eliminate all the problems, so with frustration, and I am sure, a great amount of personal disappointment, Mike Harvey was forced to discontinue importation and sale of the A.S.M. manufactured Schofield revolvers. During the project this author worked very closely with Cimarron Firearms, and indirectly with the Armi San Marco factory, and from what I saw, Mike Harvey expended large amounts of time and energy trying to bring this A.S.M./Schofield project to fruition, any failures that occurred were on the other side of the Atlantic ocean, clearly beyond his control. To my knowledge, Cimarron Firearms has made good on any and all problem Schofields by either repairing them, or refunding the purchase price.

The Navy Arms top-break revolvers

Navy Arms has long been recognized as an innovative leader in the field of replica firearms, their catalog showcases a truly impressive and diverse array of shootable replica-antique weaponry dating from the American revolution up through the settling of the western frontiers. In recent years the owner of Navy Arms, Val Forgett has contracted with the well known arms maker Aldo Uberti of Breccia, Italy to build two variations of 19th century Smith & Wesson top-break revolvers. The first of these revolvers to appear was the .45 Caliber Schofield which has already begun to make a mark with Cowboy shooters, and just last year a second revolver, the New Model .44 Russian was introduced to the American shooting public. Many of us had been hoping for a replica of the S&W American or more properly, the First Model Russian revolver which looked and was mechanically the same as the 2nd Model American but was chambered in .44 Russian caliber. For many the caliber was a concern because the .44 American with its outside lubricated *heel-type* bullets isn't commercially available and hand loading the caliber can present the amateur reloader with challenges, the .44 Russian of course uses a more conventional bullet and is available over the counter.

Navy Arms Schofield .45

Smith & Wesson manufactured almost 9,000 of the original Model Number 3 Schofield revolvers between 1875 and 1877, primarily for the United States Army and all of them were chambered in .45 S&W caliber. The Navy Arms replica Schofield in many respects, has been re-engineered by its manufacturer Aldo Uberti, but that's not all bad. Navy Arm's new revolver is machined from modern steels so it can be safely fired with smokeless powder ammunition . . . that's a good thing. The original S&W design has been altered somewhat so it could be more easily produced using modern machining methods; that is both good and bad, the degree of bad depending on how much of a purist you think you are. Modern interest for replica revolvers like this was created by the sport of Cowboy Shooting, but getting such a gun from the drawing boards onto the dealer's shelves always involves some concessions; those took place in the form of mechanical alterations to the Smith & Wesson design, along with the addition of a new hammer block safety device in order to allow the revolver to enter an American market that is very much more safety conscious than it was in the 19th century. Navy Arms replica of Smith & Wesson's famous .45 Schofield U.S. Army revolver is actually one of the most unique revolvers to be reproduced in recent times, in fact this 125+ year old S&W top-break design was one of the most intricate and complicated machine projects ever attempted by a replica arms company.

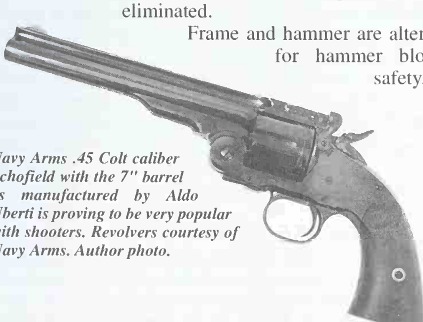
Some initial teething problems with the new revolver were experienced which the factory has made great strides with nevertheless the gun has proven itself to be quite serviceable with many now receiving regular hard use in Cowboy shooting events. The Model No. 3 design is a revolver with a jointed-frame, so after considerable shooting you can expect to see some increases in tolerances resulting from wear and hard use, and this would be true of both the original or the reproduction. We have noticed lately where some gun writers and shooters have been questioning the ability of the modern Uberti product to stand up after continued hard use, comparing it with the original Smith & Wesson; which they are assuming would have stood up better. Personally, I've fired thousands of black powder cartridges from original Schofield's, and now, after having seen quite a few Uberti-made Schofields, (and I'll confine my comments to guns that I know were set-up correctly when new) after they had fired in excess of 3,000 shots with smokeless powder ammunition. It seems to me the Uberti Schofields are actually showing less overall effects of wear and tear, and from what I have seen they are experiencing fewer broken springs than original S&W's would have after that kind of use.

These revolvers appear quite similar to the original S&W Schofield but modern mass-production has involved some pretty drastic changes in the way these are manufactured Uberti, so this new Schofield's parts are radically different from originals in almost all respects. Possibly the only exceptions to this, items that might be easily altered to work in an original S&W may be the cylinder stop spring, the extractor spring, and with alterations, the hand. Here are some of the differences you will quickly spot if you compare an S&W Schofield and the Uberti-made, Navy Arms Schofield:

The Navy Arms Schofield uses serrations on the hammer spur and on the top of the barrel catch instead of checkering. Author photo.

This is an original S&W Schofield manufactured in 1877, notice that the hammer spur and barrel catch top are finely checkered. Author photo.

Barrel catch screw is headless.
Barrel top strap is longer, farther forward on rib and higher.
Cylinder is lengthened forward and gas ring seal has been eliminated.
Cylinder stop ball (locking bolt) is shorter.
Extractor cam bushing is eliminated.
Extractor ratchet teeth differ from original.
Extractor stem is hexagonal, not square, stud is eliminated.
Frame and hammer are altered for hammer block safety.



Navy Arms .45 Colt caliber Schofield with the 7" barrel as manufactured by Aldo Uberti is proving to be very popular with shooters. Revolvers courtesy of Navy Arms. Author photo.

Front sight is colored brass in place of steel.
Hammer block safety is a new addition.
Hammer stud is polished 'flush' with the frame and has no spanner wrench cuts.
Hand and spring differ from original.
Joint pivot diameter has been increased.
Mainspring shape is altered.
Screw threads all differ from original.

Uberti's replica is chambered in .44 S&W Russian caliber and retains the Russian hammer/barrel catch interlock, the hooked trigger-guard and the large knurled takedown screw on the barrel top-strap. Revolver courtesy of Navy Arms. Author photo.

Navy Arm's New Model Russian .44

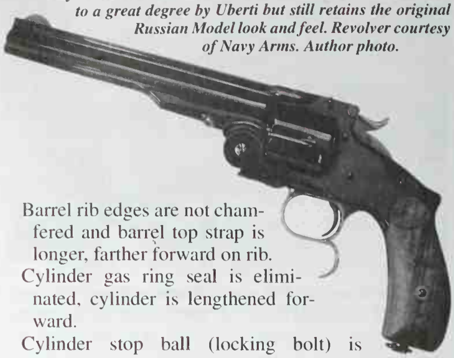
The newest top-break replica revolver to be released by Navy Arms is also being manufactured in Italy by Aldo Uberti. This gives the appearance of the Smith & Wesson New Model Russian .44 single action revolver, with a "Russian hooked" trigger-guard and a knurled thumb-screw in the barrel's top-strap for ease of cylinder removal. Navy Arm's new top break's cylinder is chambered to accept the .44 S&W Russian cartridge, but has a 7" barrel rather than the 6" of the S&W Third Model Russian, and the revolver butt comes with a lanyard ring, much like that of the original. On first glance, this New Model Russian looks just a bit top-heavy, and the barrel rib looks wider than it should although a closer look reveals the Uberti factory did not chamfer the edges of the barrel rib at an angle like Smith & Wesson did, giving this modern New Model Russian's barrel a wider and higher look. Actually, the measured dimensions of this barrel are very close to an original Smith & Wesson. In order to gain more strength in the thin area at the juncture of the barrel and its top-strap Uberti has extended the wider portion of the top-strap farther forward, into the rounded area near the rear of the barrel in a manner similar to the earlier Navy Arms Schofields, an alteration that does add strength to an originally weak area, that also serves to further the revolver's somewhat top-heavy appearance. The new

Russian still points very naturally though, just like its older cousins always did.

Navy Arm's New Model Russian does not use the rack and gear extraction mechanism that the S&W Russian did, instead Uberti used the much simpler cam with a hook and pawl, just like the system they use on their Schofield Model, but this internal change will not be readily apparent until you disassemble the revolver. Uberti has also increased the diameter of the joint pivot (hinge) and its screw. Part of this revolver's appeal is its wonderful packaging; Navy Arms supplies the Russian Model in a classic 1870s type, hinged cardboard box with instructions written in 19th century 'Smith & Wessonese'; the packaging is cool! Unlike some of the Italian replica pistols we have seen, both the Russian revolver I used for the tests in this book and another tested almost a year previously had a good combination of barrel groove diameter at .4295" with the cylinder's chamber mouths on the former measuring a consistent .431".

As you can see from the information and chart below, while they have kept pretty well with the S&W lines, the Navy Arms New Model Russian (NMR) has been heavily re-engineered by Uberti, and this new version's component parts are dimensionally different from the original in almost all areas. As a matter of fact the only exceptions to this, parts that might be easily altered to work in an original Russian model would be the cylinder stop spring, the extractor spring, and with more alteration the hand. Here for your information, are some of the major differences between an S&W Russian and the Navy Arms NMR:

Barrel length is 7" instead of 6 1/2 ".
Barrel catch cam and its spring differ from original and top-strap has no *floor* to support them.



Navy Arms New Model Russian .44 has been re-engineered to a great degree by Uberti but still retains the original Russian Model look and feel. Revolver courtesy of Navy Arms. Author photo.

Barrel rib edges are not chamfered and barrel top strap is longer, farther forward on rib.
Cylinder gas ring seal is eliminated, cylinder is lengthened forward.
Cylinder stop ball (locking bolt) is shorter.
Extractor system is not rack and gear; uses Schofield system.
Extractor cam bushing is eliminated.
Extractor ratchet teeth differ from original.
Extractor stem is hexagonal, not square, stud is eliminated.
Frame and hammer are altered for hammer block safety.
Front sight is pinned in place in lieu of being a forging, is colored brass in place of steel.
Hammer block safety is a new addition.
Hammer stud is polished 'flush' with the frame and has no spanner wrench cuts.
Hand and spring differ from original.
Joint pivot diameter has been increased.
Mainspring is shorter and shape is altered.
Screw threads all differ from original.
Strain screw location is higher on grip strap.

Dimensional comparisons: Original S&W -vs- Navy Arms/Uberti Russian Models

	S&W 3rd Russian	Navy Arms Russian
Frame width	.750"	.765"
Barrel groove diameter	.431"	.4295"
Barrel height over rib at muzzle	.930"	.968"
Barrel length	6.5"	7"
Barrel OD at muzzle	.655"	.655"
Barrel OD at rearmost	.752"	.761"
Barrel top-strap width	.755"	.778"
Cylinder chamber mouth ID	.430"	.431"
Cylinder length w/o gas ring	1.410"	1.500"
Cylinder outside diameter	1.425"	1.502"
Cylinder opening length in frame	1.610"	1.659"

Trouble Shooting and repairing Smith & Wesson Top-Break Revolvers

The Navy Arms Schofield

The reader should be aware that the Uberti manufactured-Navy Arms Schofield and New Model Russian revolvers are based, however loosely, on the original top-break design principals designed so long ago by Smith & Wesson. Because of this, many of the troubleshooting and repair procedures referred to here may be applied directly and indirectly to both original Smith & Wesson single action top-break revolvers and replicas thereof. We've elected to include a rather complete troubleshooting and repair guide here, under the Navy Arms Schofield heading for the simple reason that so many of these revolvers are now in everyday use.

Take a good look . . . before you leap. Many gunsmiths today are just not familiar with this old design, which was well ahead of its time in the 1870's. The modern gunsmith desiring to work on these top-break revolvers should take the time to carefully examine a Navy Arms replica alongside an original Smith & Wesson Schofield. Seeing them side by side you will very quickly note the major differences between these two similar looking revolvers. You will also notice differences in machined fits and finishes. What have unfortunately become 'allowable tolerance levels' between the revolvers produced in the 1870s, compared to those made in the 1990s have increased dramatically. In other words, the differences in the way both moving and fixed parts are fitted and finished to mate with one another, and in how much clearance moving parts are allowed to have for interaction. Tolerances in lots of newer products are given far greater leeway than an 1800s gun manufacturer would have allowed. These are some of the tolerances that we will look after in our attempts to bring the replica product into a more functional, and finished mechanical state.

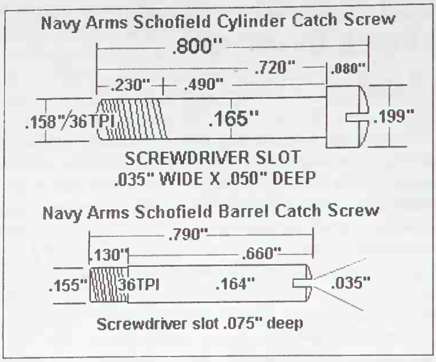
It won't matter very much how many alterations were made to this design overseas; the fact is the 1875 S&W Schofield is still the parent design for these replicas. Many of the problems you may encounter in a well-used replica can be the direct result of wear or of distortion as result of hard use, sometimes the problem may come directly from imperfect factory fitting. Much of this can be corrected, at least to some degree, however knowing how and why the original Smith & Wesson Schofield worked will make the job a far simpler task for the latter-day gunsmith.

One of the most notable departures from the S&W design is that the Uberti cylinder has been lengthened at its front end to allow the new revolver to accept the .45 Colt and 44/40 cartridges. Original S&W Schofields were built on the standard Model Number 3 American frame length and fired the shorter .45 S&W Schofield cartridge, so their cylinders were too short to accept either the .45 Colt or the 44/40 cartridges. Uberti's changes, by lengthening the cylinder to the front have made it necessary to shorten the rear portion of the barrel by a similar amount, enabling the longer cylinder to function within the confines of the original Smith & Wesson cylinder opening in the frame. The alteration has however, forced the factory to do away with the excellent 'gas ring seal', this was a feature of original Smith & Wesson's which prevented the base pin area from being fouled by black powder residue. All modern replicas that lack this 'gas ring seal' will experience cylinder seizure from black powder fouling, often after firing only a few cartridges. Thus for black powder or Pyrodex shooters the replica top-breaks have a designed-in problem, and there is very little any gunsmith can do to correct it. This lack of an effective gas ring seal does not seem to present any problems when exclusively smokeless ammunition is used.

To troubleshoot the Uberti/Navy Arms Schofield we will use a procedure which the author developed over the years for use on genuine Smith & Wesson top-break revolvers, and this is only altered where required to suit the changes we will encounter on the replica. Starting off with the basics, we will eventually address most of the revolver's working components. As we hinted at earlier in this chapter, before trying any of this work the gunsmith should start by gaining a good understanding of those basic operational principals that are unique to this top-break design. One good way to gain that knowledge is to disassemble both an original and a replica Smith & Wesson, spending your time to build an understanding of how all the parts function and what their relationships are. When you have figured out just *why* the old Smith & Wesson design worked so well, you will easily be able to spot why the replica might have a similar problem, the most effective teacher here is the hands-on method.

Look first for unique problems!

Before you begin any serious work, there are certain areas of the replica Schofield revolver that you should look over carefully to try and determine if the revolver in your hand will be worth while repairing. Taking this step is important, it might save you unnecessary work later on. So let's start here: While the gun is latched closed; can you move the barrel up and down at the breech? Do



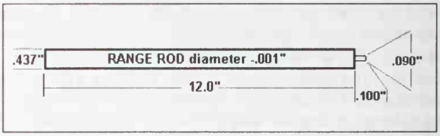
you see play and clearance in the barrel catch/cylinder catch lock-up? If so, try to see if this play is from a loose or a poor fitting barrel catch screw, or cylinder catch screws which could be allowing the either of these parts to move up and down in their respective mortices. Neither of these parts should show movement, under any circumstance. When a poor screw is the culprit, you should manufacture another to specifications that are more closely fitted to your individual gun as outlined later in this chapter. When poor screws and loose fitting parts are not to blame, there is a chance the gun may have been over-fitted from the factory or that it might be severely worn from long use. You should consider sending any revolver like this back to the manufacturer or importer for replacement of the faulty or worn out parts. Look carefully at the fit of the barrel catch to the cylinder catch; at the surfaces where they lock and mate together. The fit of these critical components should be square, plumb and of full contact.

This is what the rear of the Navy Arms Schofield barrel looks like without the cylinder in the way. Notice how short the forcing cone area is. Revolver courtesy of Navy Arms. Author photo.

Has there been a complaint of poor accuracy and/or of lead spitting from this gun's owner? Look close, the problem could be one that is not easily remedied. Measure the diameters of the cylinder chamber mouths, some of these revolvers have cylinder chamber mouths that were machined on the large side, with some as large as .462" in .45 Colt, and as big as .435" in .44/40. Those would be unusually large over-sizes, although such large chambers have been found on rare occasions. If your cylinder's chamber mouths are measuring .430" or larger in 44/40 caliber or .456" or larger .45 Colt: your cylinder's chamber mouths are too large to allow for good accuracy and will most likely contribute to lead spitting. Any revolver with cylinder dimensions like this will probably never shoot well, and will usually spit lead in spite of your best efforts to stop it. A gun that exhibits dimensions like the above should be returned to the maker or importer to have another cylinder installed, one with more appropriately sized chamber mouths.

Troubleshooting

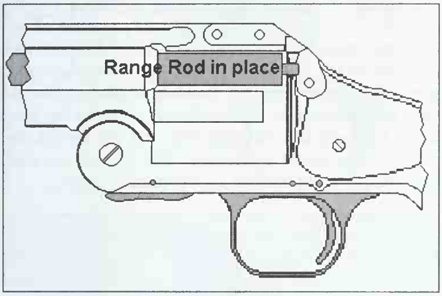
What about timing and indexing? Timing and indexing problems might be apparent, but since we know this is a revolver that uses a jointed frame, it is absolutely mandatory that you make certain the major component parts are correctly fitted and aligned before attempting repairs to any other suspect areas. In truth, by correcting the relationship of the frame to the barrel you will very often eliminate many other sorts of timing and indexing maladies. Our beginning steps will be to insure that the barrel is trued with the standing breech of the lock-frame, and that it is being locked securely in place by the barrel catch.



Ranging. The center of the charge hole (this is the center of the chamber hole that accepts the cartridge in the cylinder) should point down the exact center of an imaginary line that runs through the center of the barrel's bore which also must be aligned precisely with the exact center of the firing pin hole in the standing breech. In the top break design, the barrel and cylinder are separate parts which pivot and move away from the standing breech in an arc when the gun is opened. What we want to see is if that charge hole center is properly aligned with the center of the firing pin hole when the revolver barrel is in the closed and locked position. This alignment has been termed 'ranging' and may be gauged with a tool called a 'range rod'. To use the range rod it is slid down the barrel's bore while the gunsmith makes note of any resistence encountered as the rod enters the cylinder chambers.

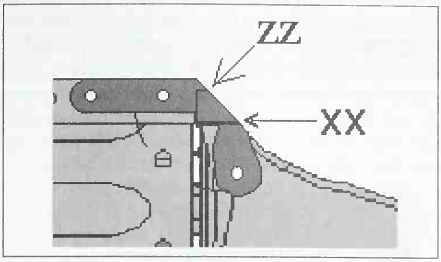
Without the top-break design we will ask the range rod to perform another test that would not normally have to be performed with a solid frame revolver, that of checking frame/barrel alignment. Our special top-break range rod is equipped with a pilot that is intended to enter the firing pin hole. A suitable .45 caliber range rod may be fashioned from .4375" (7/16"), or in .44 caliber from .413" (or "Z" letter size) drill rod, (the actual outside diameter of the range rod may have to vary with the individual revolver's bore size), then turning the pilot-end down to length of one-tenth of-an-inch (.100") and to a diameter that will enter the firing pin hole easily, this is usually a diameter of about ninety-thousandths of-an-inch (.090".)

The first ranging test will be to check the all-critical barrel to frame alignment. For this test both the cylinder assembly, the mainspring and the hammer are removed from the weapon, all the other component parts may be left intact. As the illustration shows, the range rod should slide down the barrel and enter the firing pin hole exactly on center.



If the range rod won't enter: a high rod contact indicates the barrel is not closing fully. A low rod contact indicates the barrel is over-closing. Rod contact on either side of the hole indicates a bend or deformation of the frame and/or the barrel to either side. The critical point of contact that will determine where the barrel will cease moving down to its closed position with the frame is shown in the illustration as 'ZZ', and may be viewed by removing both the barrel catch and the cylinder catch from the revolver.

To correct high rod ***contact***; the condition when the barrel is being held from closing completely, first determine *why* the barrel is not closing. Is the barrel being held up by the *rear of the barrel* contacting the frame top (at 'ZZ')? Or, is the lower-rear surface of the *cylinder catch* contacting the rear frame top-sides (at 'XX")? If it is the *rear of the barrel's top-strap* contacting the frame top; material may be removed from the top of the frame at the point shown in illustration 2. Slowly, carefully, and with a smooth cut file remove only enough material from the frame top (at 'ZZ') to allow the barrel to move down far enough so the range rod pilot will enter the firing pin hole freely. Use great caution to file this area plumb and flat, using a small machinists square to guide you.

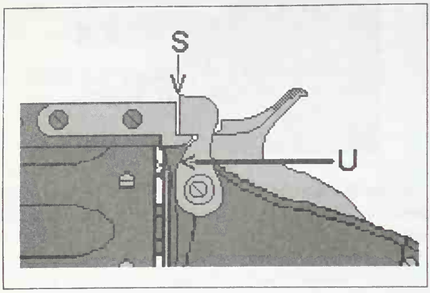


When the barrel is closing too far, the top of the frame at 'ZZ' should be built up with weldment and filed down to achieve the correct alignment. If it is only a small amount, the very rear of the barrel's top strap might be peened, causing a small amount of metal to flow downward to accomplish the same goal. If on the other hand, when the cylinder catch is installed on the barrel the lower-rear surface of the Cylinder Catch is contacting the rear frame top-sides; thereby holding the barrel up too far, material may be carefully filed from each rear frame top-side (as shown in the illustration, these are the frame shoulders at either side and below the 'pyramid' at the frame top, point 'XX') until the range rod pilot will enter the firing pin hole freely.

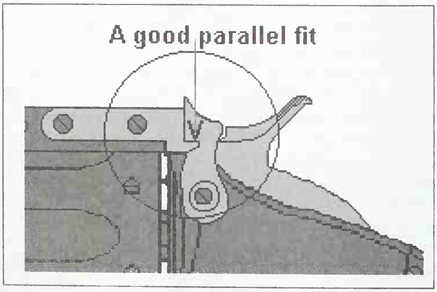
Sideways misalignment of the barrel/frame may be corrected by clamping the barrel by its sides in a padded vise and then carefully twisting the frame toward the opposite side from the misalignment, using only your hands on the grip frame as a lever while keeping an eye on the range rod's alignment as a guide to your progress. Go slow . . . you don't want to get carried away during this procedure, these frames are in fact, surprisingly soft, so it usually will not take a great deal of effort on your part to correct a misalignment.

Now that this matter of barrel to frame alignment has been settled; let's assemble the barrel catch (with its spring) and the cylinder catch onto the gun, and then close the revolver. Before proceeding any further, examine the fit of the cylinder catch with the barrel top-strap. Open the gun again and swing the barrel forward. Loosen those two cross screws that hold the cylinder catch onto the barrel about 1/2 turn each and check to see if the cylinder catch is loose enough so that it can be moved, or wobbled about. The European manufacturers have not fitted their critical component parts in the same manner as Smith & Wesson did, and the fit of their screws is usually poorer still. A loosely fitted and moveable cylinder catch will show up soon after firing as the wear becomes pronounced, and the barrel/frame lock-up grows ever worse. If the cylinder catch displays looseness of this sort, the only recourse that seems to make sense is to build yourself new cylinder catch screws that are more precisely fitted to both the barrel

and to the catch than the originals were to a tolerance that is custom-suited to the individual gun, particularly in the un-threaded shank portion. When you have your screws built and fitted so that there is no cylinder catch movement when the screws are one-half turn away from tight, harden them to about 40-45 Rockwell C.



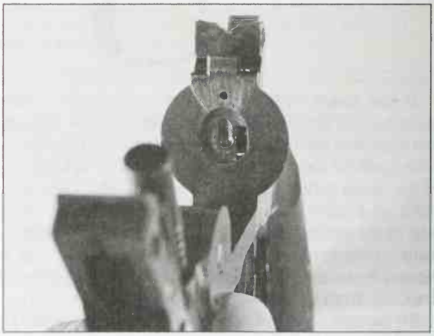
Now let's see if the barrel catch is closing all the way forward. In a perfect situation, the front face of the barrel catch should be in contact with the rear face of the cylinder catch at (S). If (S) contact is not being made and there is a gap between these vertical surfaces, we will have to look to determine why. Look over Illustration 4, is it #1: The lower-front leg of the Barrel Catch striking the frame at (U)? Or is it #2: Looking just above area (U); is the barrel catch leg striking the bottom of the Cylinder Catch cam surface? Either or both these conditions will cause the Barrel Catch to be held to the rear, preventing full closure. If it is condition #1, we will want to remove a small amount of material from the front of the legs of the barrel catch, thus allowing it to move forward far enough to establish contact at (S). If however it is condition #2, material should be carefully removed from the rear-lower camming area of the cylinder catch cam surface only until the barrel catch is allowed to move far enough ahead to establish contact at (S). Once this is achieved, the camming area you worked on should be stoned smooth, since that area contacts the barrel catch face on closing. The illustration below shows a perfect fitting barrel catch/cylinder catch.



By following the preceding steps, you should now have a revolver whose barrel locks tightly closed, and in perfect relationship with the frame. In this jointed frame design it is all important to be certain those relationships are correct before proceeding any further.

Included in this section is a parts blow-up illustration from Uberti USA. Note that the parts are sometimes called different names by Uberti from the names used in our text, which are the same as the original S&W names (see explanations at 'nomenclature'.)

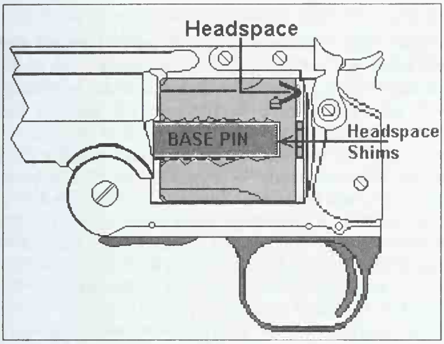
Misfiring, poor carry-up and inconsistent cylinder rotation: Misfires in the Navy Arms Schofield are most often caused by one or both of the following; 1) excess headspace, and/or 2) insufficient firing pin protrusion. As explained in Chapter 4r, headspace in revolvers is the distance between the front face of the standing breech and the rear of the cartridge rim. This fixed distance must be maintained since too little headspace can cause the cartridge case heads to drag on the recoil shield, causing rough cylinder rotation and too much headspace will move the primer away from the firing pin, giving mis-fires. One indication that a revolver might have too much headspace is the presence of cylinder end-shake (front to rear movement). You can measure headspace by closing the gun with an empty cartridge case or dummy cartridge in one chamber, place the hammer at half-cock and slide feeler gauge blades between the cartridge rim and the breech face until you encounter resistence. The correct measurement should be .006" with a maximum of .008".



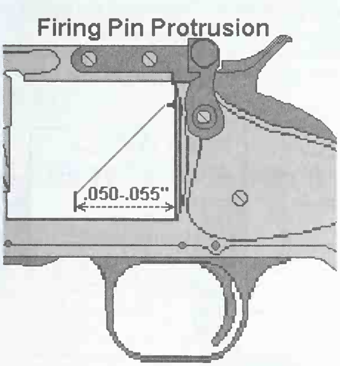
A view of the breech face of the Navy Arms Schofield. Just under the hole for the firing pin you can see a round machine cut which acts as the seat for rear cylinder axle. Revolver courtesy of Navy Arms. Author photo.

Correcting excess headspace means we need a way to push and hold the cylinder to the rear, eliminating at the same time any end-shake in the cylinder. But if we do this to a top-break revolver we will increase the barrel to cylinder gap, this is in the nature of the design and the gap is only adjustable at the sacrifice of headspace. The cylinder is pushed and held to the rear by the use of

hardened steel shims in the shape of little disks, made to the specifications shown in the drawing. Shims are placed in the base pin hole of the cylinder after removing the extractor rod and spring, when re-assembled the extractor spring holds the shims in place. You would add shims to get the gun to the point where the barrel will just not close with the cylinder in place on the barrel. Once you have it to this stage, carefully remove metal from the rear face of the base pin (keep the face of the base pin square) until you get to where the gun will close and the cylinder still revolves free. The rear-inside shoulder of the cylinder against the rear of the base pin body is the correct bearing surface for headspace, not the front of the gas ring where it meets the barrel.



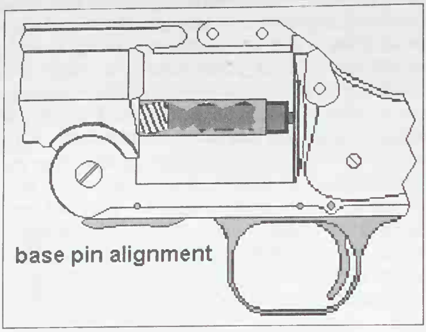
If you restore correct headspace and eliminate cylinder end-shake you will at the same time reestablish the contact that the extractor stud should have with the axle point (the small depression) at the center of the breech face, and you will have moved the extractor ratchet teeth back into the breech face where they are closer to the hand. Very often this operation alone will cure a problem with insufficient 'cylinder carry-up'.

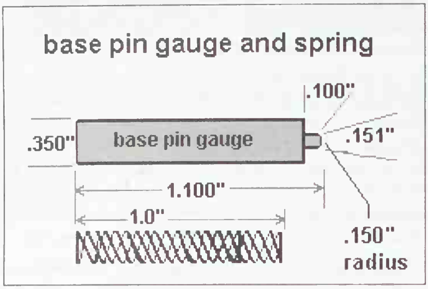


When misfires are occurring the second area which you should examine is the amount of 'firing pin protrusion' (this is the measured distance that the firing pin sticks through the breech face of the frame when the hammer is all the way down). This has sometimes been a problem in Navy Arms Schofields, the correct amount of measured protrusion is .050"-.055", but as little as .045" may give consistent ignition. You may encounter these revolvers with as little as .024" firing pin protrusion and these short firing pins will never deliver good ignition and misfires will continue as long as the problem is not addressed. We have been assured by Maria Uberti of Uberti USA that the factory is indeed making hammers with longer firing pins, check with them regarding the availability of these replacement hammers. If you don't want to replace the hammer, a cure we have used successfully has been to build up the firing pin tip by micro-welding, using Brownell's 2% nickel-steel welding rod. This lengthened area should be brought forward and down, following a general direction in the arc of the hammer's rotation, then shaped to fit within the confines of the firing pin hole, taking care that the altered firing pin does not contact the frame. After the altered firing pin has been correctly lengthened, shaped and polished, heat only the tip to a cherry red color then quench it in motor oil.

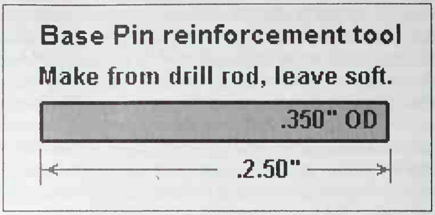
More poor carry-up. It's not a good idea to always blame poor cylinder carry-up on a faulty hand or a worn extractor ratchet, it might be either one; but it just as well might not. Make certain that the cylinder has a perfect axis to rotate on first. See if the cylinder is a good fit with the base pin. With the revolver open, check to see if any side-to-side wobble is present in the cylinder, a good fit here is essential. The base pin is the axle for the cylinder which should be able to spin true and without any lost motion. Lost motion in the rotating cylinder which is caused by looseness on the axis will show up right away as poor timing, it can also allow a cylinder to rub on the barrel top strap or against the back of the barrel. A base pin that is misaligned in the frame may also cause some of the same troubles, read on.

After having corrected the headspace, if your revolver still has a cylinder carry-up problem then you may finally need to look at the part that rotates the cylinder: the hand. Still, before we do that let's try a quick check to see if the problem goes away after we insert dummy cartridges in all six chambers. Sometimes a gun will have an extractor shaft that is a loose fit in its bore in the cylinder and this can give you poor carry-up when the chambers are empty, this problem may not exist when the chambers have cartridges in them.

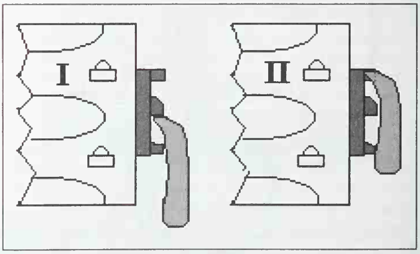


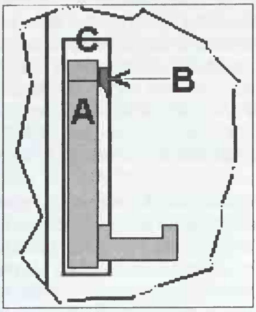


Base pin alignment: We are not yet ready to blame the hand or the extractor ratchet for timing problems, at least not quite yet. Like we mentioned above, a base pin that is misaligned can dramatically throw off the geometry of the rotating cylinder, it can also be one cause for poor carry-up and cylinder drag. The center of the base pin bore should line up perfectly with the small, rounded depression you see at the center of the breech face (this depression accepts the extractor stud and is the rear axle point for the cylinder.) You will have to make a tool like the one shown in the illustration and use a mild coil spring about one inch long and of the same outside diameter as the tool. With the cylinder assembly removed, we will use this tool to check the alignment of the base pin with the breech face of the frame. With the barrel open, insert the spring into the base pin, followed by the base pin gauge tool (pilot to the rear) then close the gun as shown in the illustration. The pilot of this tight fitting gauge is supposed to line up perfectly with the depression at the center of the frame in the breech face. If the tool pilot does not line up, make note of the direction of misalignment. You may "move" the base pin by carefully bending it, using a plastic mallet to gently coax the base pin in the opposite direction from its bend. The barrel should be open for this operation and the base pin reinforcement tool should be in place while you gently tap the rear area of the base pin.

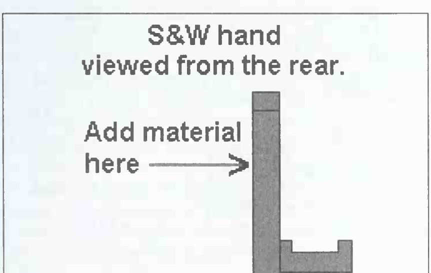


The hand, ratchet and 'carry-up': The hand that will rotate the cylinder positively for most of its cycle, but then fails to push the cylinder to rotate into index with the cylinder stop by the time the hammer has reached the full-cock position may need to be replaced, or enlarged by welding to provide a more positive push on the extractor teeth. In contradiction to a popular belief, it is not necessarily the length of the hand, it is hand width that is lacking when poor carry-up is the problem. Single-cog ratchet systems like the S&W shown here, the hand length would have the most effect on the beginning **(I)** of the rotation cycle, but not at the end **(II)**. The hand needs to fill up its 'window' in the frame from side-to-side, with just enough side clearance to allow it free movement to positively push the cylinder around into battery. It is a very poor practice to rely on the cylinder's rotational inertia to revolve it into battery. Assuming everything else is working correctly, if you were to 'put a brake' on the cylinder with some finger pressure during the cocking/rotation cycle, the hand should be able overcome your resistance and push the cylinder around to the locked position with mechanical certainty. It doesn't matter what revolver design it is, at the point when the hammer reaches the fully cocked position is precisely the time when the cylinder should reach the point of mechanical lock-up.

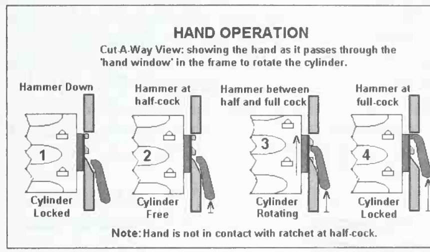




With the sideplate off, refer to the illustration and see how the hand **(A)** is working on the active ratchet tooth **(B)** by looking in through the sideplate opening behind the hand. Pull the hammer all the way back and make note of where the active ratchet tooth **(B)** has traveled. You can see at this point that the active tooth cannot be moved up any further, it can only be moved to the right. Hands are only capable of moving up and down, they cannot actively move side-to-side, although they may passively due to excess clearance in the hand window **(C)**. You will often notice that while the hand may have come to its upper-most position, it lacks the sufficient width to push that ratchet tooth the last few thousandths of an inch over to the right that would rotate the cylinder into index. This can easily be proved by measuring the hand's **(A)** width against the width of the hand-window **(C)** in the frame. If the hand-window is any more than .002" wider than the hand, then a wider hand (one which would be capable of exerting side pressure on that active ratchet tooth) would help improve cylinder carry-up. If a wider factory made part cannot be procured, your only course will be to micro-weld material onto the left side of the hand (the weld is applied to its entire length,) then shape it back down with files and finally Arkansas stones, until it fits the window with a maximum of approximately .001" side clearance. Maria Uberti, of Uberti USA informs us wider, 'oversize' hands for the Navy Arms Schofield are manufactured by Uberti and are for sale to gunsmiths by the Uberti USA parts department.



"Clicks": The illustration shows the cut-a-way view of the left side of a Smith & Wesson top-break single action revolver, highlighting the stages which happen throughout the operation of the hand. **Step 1** illustrates the hand position with the hammer all the way down. You see the hand is well below the ratchet tooth, its active lower-point rests on the lower portion of the machined 'ramp' in the hand window of the frame. Note that when the hammer is placed at half-cock, in **Step 2**, the active lower-point of the hand is moved up closer to the ratchet tooth, but it is still in contact with the 'ramp' under the hand window, preventing further forward movement; so no contact can yet be made with the ratchet tooth. Thus unlike a Colt single action, when the hammer is placed at half-cock, there should be no audi-



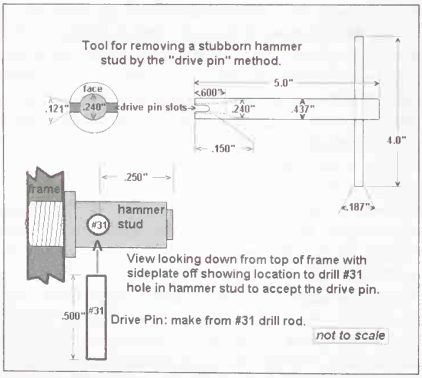
ble ratchet clicking heard while the cylinder is being rotated by hand. If the active point of the hand has been altered so that contact with the ratchet is occurring at half-cock; the hand's protruding point will tend to bind on the ratchets when the barrel is closed, this will eventually damage the ratchet teeth. **In Step 3** we see the hand as the hammer is being pulled rearward past the half-cock position. In this step the top of the active hand point has moved up over the 'ramp' in the frame's hand window, allowing it to tilt forward where it comes into contact with the lower edge of the ratchet tooth, pushing the tooth upward, which causes the cylinder to rotate. By **Step 4** the hammer has reached the fully-cocked position. Notice the top of the active hand point is no longer in contact with the lower edge of the ratchet tooth, instead; the right side of the active hand point is now fully in contact with that same ratchet tooth, pushing it to the right.

What you want to achieve is that condition where the cylinder is mechanically rotated into the locked position at the exact point when the hammer reaches the full-cock position. When the cylinder locks into battery much earlier than the hammer reaches full-cock, you can have a condition called overtiming. Here the hand is attempting to rotate the already locked cylinder and this might prevent the hammer from reaching the cocked

position, and trying to force the issue by pulling back harder on the hammer will only cause more damage to the workings. Now the other side of the coin, if that hammer reached full-cock *before* the cylinder was mechanically locked into battery; there is always a chance that the gun may be fired while the cylinder unlocked; potentially a very dangerous situation and one that should be avoided at any cost. Once we have gotten to this point we should have a Schofield that is plumb, true and right with the world. With these basics out of our way, let's get a look at the rest of the action.

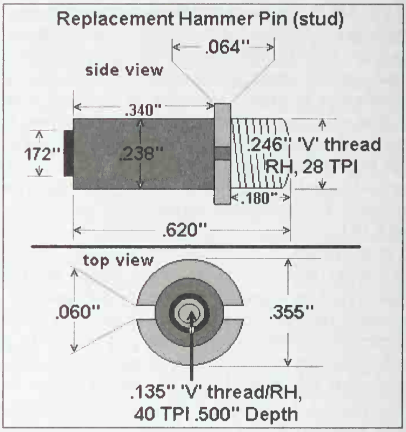
Before going after the cylinder stop, and hammer and trigger actions: You will want to check the hammer and its fit on the hammer stud. First, check to see if the hammer stud (Uberti calls this part a 'hammer pin') is a tight fit in the frame and that it hasn't become unscrewed. They have not provided any means for tightening the hammer stud but the original Smith & Wesson did. Refer to the illustration of the hammer stud showing S&W type slots made into the flange of the Uberti stud to allow it to accept a spanner wrench. If your gun's hammer fits the original stud well but the stud is simply loose, you may remove it and alter its flange like the stud shown so it will accept a spanner wrench like the one in the drawing, then the stud may be properly tightened.

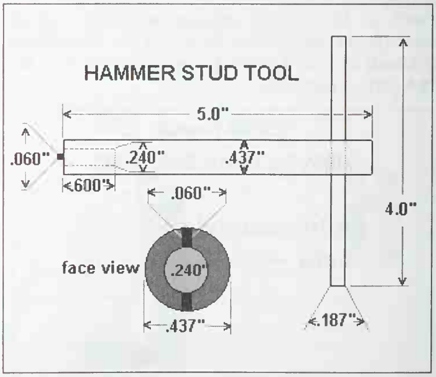
A loose fitting hammer that is wobbling about may also cause carry-up failure, in addition to its causing poor and inconsistent trigger pulls, with the possibility of hammer block safety malfunction. If the stud is secure in the frame, there are two distinct areas where you may find a loose fit of the hammer; 1) the hole in the hammer may be too large for the stud pilot; in which case a new stud with a more properly sized pilot would cure this, and 2) there may also be excess clearance at the sides of the hammer.



Removing the old hammer stud: Sometimes a collet wrench may be employed to unscrew the old stud, but sometimes a truly tight fitting stud will be found that needs something more substantial to make it move. An alternative means for removal; the 'drive pin' and spanner wrench method is shown in the accompanying illustration. This method will absolutely remove the stuck stud, but ruins it for any future use. Both the tool and the drive pin are made from a drill rod. The drive pin can be left 'soft', but about the front inch of the removal tool should be hardened to about 42-45 on the Rockwell C scale.

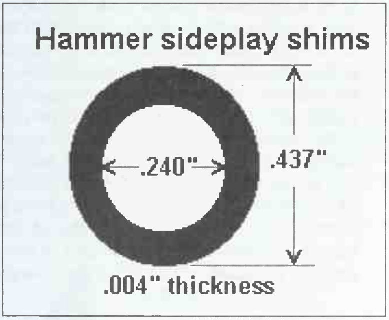
Addressing hammer looseness on the stud: Factory new hammers appear to have a pilot hole that measures .239" I.D. and a hammer stud pilot O.D. of about .238", giving a satisfactory .001" clearance. Should your gun require a larger diameter pilot in order to shrink the clearance factor, a new hammer stud can be shop lathe turned from drill rod to the specifications shown in the drawing, then hardened to about 42-45 on the Rockwell C scale. Keep in mind that the nominal pilot diameter of .238" should be altered to suit your hammer's specific





size requirements. As we mentioned above, original S&W revolvers had hammer studs with 'spanner cuts' made as a part of the stud flange, removal and installation was accomplished using a tool similar to the one shown in the drawing, which is also shop made. Uberti factory hammer studs don't have these spanner cuts, but shop-made replacement stud you will make does use spanner cuts, and this special spanner tool can be made to ease its fitting and installation.

Hammer side-clearance is another matter: Widths of Navy Arms Schofield hammers are generally .310"-.312", but sometimes the clearance between the side-plate boss and the hammer stud flange can be as much as .350". That leaves a lot of side-clearance and so room for the hammer to wobble around. Excess clearances can directly affect the hammer block safety operation as well as the consistency of trigger pull; important safety factors. An effective way to remove most of this side-clearance is by using .004" thick, hardened steel shims that are placed over the hammer stud pilot, then on either side of the hammer; in an attempt to center the hammer within the frame, eliminating the side-clearances at the same time. Be careful; don't use so many shims that the hammer binds up when the sideplate is tightened.



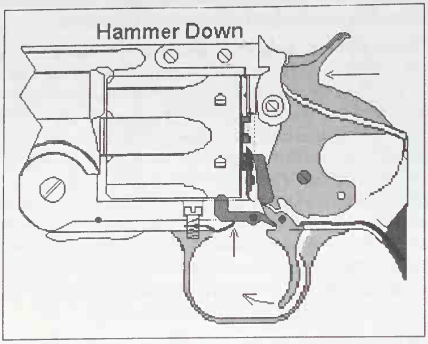
The Uberti hammer block safety is an integral part of the Navy Arms Schofield, unlike the original Smith & Wesson Schofield, which had no such feature. This is a simple and reasonably effective spring loaded, 'sliding bar' type of safety that becomes activated when the hammer is placed in the cock position. Should the hammer fall from the cock position due to the gun being dropped, causing sear breakage; the safety bar will remain up or in the 'on' position, preventing an accidental discharge. When the hammer becomes fully cocked the safety pin rides up over the cam on the safety bar so the safety remains in the 'on' position, the safety is pushed back down out of the way (to the 'off' position) by the hammer safety pin as the hammer falls from fully-cocked after the trigger is pulled to fire the cartridge. Hammer block safety operation can be adversely affected by side-play in the hammer, from a loose hammer stud or a loose fit of the hammer on its stud.

Inter-locking hammer and barrel catch: Take notice of the machined 'shelf' at the front of the hammer's top, just above the firing pin. This flat shelf area is meant to move under a machined recess at the rear of the barrel catch when the hammer is down in the fired position. So when the hammer is fully forward, the hammer inter-locks with the barrel catch and this prevents the barrel catch from moving rearward. The inter-locking of the hammer and the barrel catch allows the barrel catch to release the barrel/cylinder assembly *only after* the hammer has been pulled back into either the half-cock notch, or to the fully-cocked position and was a part of the original S&W Schofield design.

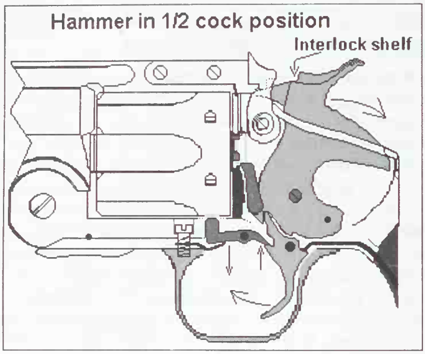
If your revolver measures as having insufficient firing pin protrusion, check to be sure the hammer isn't hitting the barrel catch at the inter-lock before you discard the hammer. Hammers should never actually contact the barrel catch, and any contact here can potentially prevent the hammer from moving all the way forward. The contact between the two parts can usually be eliminated by relieving the machined seat-recess (see illustration) area located in the rear of the barrel catch; use caution while you are removing metal here and try to maintain the factory-original shape of this recess.

Your next check point will be to see what sort of a fit the trigger has on its axle; which is the trigger pin. Triggers that are a loose fit on their axles, allowing them to wobble around, can't be expected to maintain a safe and consistent trigger pull. This indecisive trigger also may have an effect on cylinder stop operation. It is only by having a trigger and hammer that are well fitted to their axles that you can set, and be certain of maintaining, consistently good trigger pulls. The ideal situation would be when that trigger pin is just .0005" to .001" (that is five-ten thousandths-of-an-inch minimum to one, one-thousandth-of-an-inch maximum) smaller than the pivot hole in the trigger. To achieve this sort of fit you may well have to make a new trigger pin from a drill rod, and if you do after you have fitted the new pin, it should be brought to 42-45 on the Rockwell C hardness scale to guard against wear. Think about the fact that if you have had to make the trigger pin size much larger than the standard pin in order to achieve a good fit with the trigger, then the pin holes in the frame will also need to be reamed to match the size of and to hold the new pin securely.

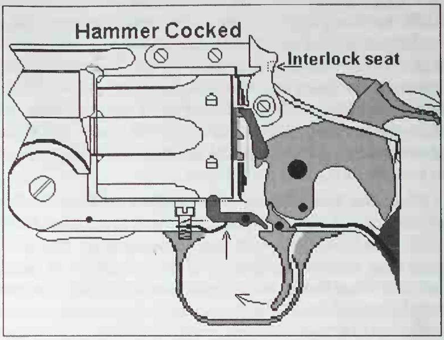
Cylinder Stop Operation: This kind of cylinder stop is trigger actuated. Having said that, the final positioning of the cylinder stop will always be in direct relation to the position of the trigger, which in turn is governed by the position, and/or the condition of the hammer's notches. The Smith & Wesson cylinder stop has three positions, and when operating correctly they should perform as follows:



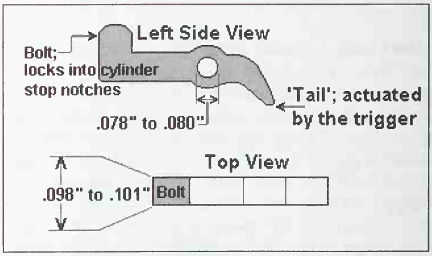
1) Hammer down: Cylinder stop is not in contact with the trigger and so its front or "locking bolt" end is being pushed all the way up by the tension from the cylinder stop spring, through the frame opening and into the cylinder stop notch in the cylinder.



2) Hammer at cock: The trigger has been pushed forward by tension from the trigger spring so its sear has dropped into the safety notch of the hammer: The hammer's safety notch is deeper than both the cock-notch and the forward hammer area, thus allowing the trigger to rotate farther in this position than in any other. The lower portion of the trigger has rotated forward under trigger spring tension, so the cylinder stop tail has been pushed up by the flat cam surface at the top-front of the trigger, this forces the front or "locking bolt" portion of the cylinder stop to pivot or rotate down, overcoming the tension of the cylinder stop spring and unlocking the cylinder so that it is free to rotate.



3) Hammer cocked: As the hammer was drawn back from the cock position, the trigger followed the searing surface along the bottom of the hammer, which provides a camming action to the trigger as it is forced to rotate in the opposite direction; this causes the lower portion of the trigger to rotate toward the rear, thereby its contact with the cylinder stop's tail is released. The cylinder stop has now been freed so it may be pushed back up by the tension from the cylinder stop spring which forces the cylinder stop back up through the frame opening and into the cylinder stop notch to lock the cylinder. When the hammer reaches the cocked position, the trigger sear drops slightly as trigger spring tension forces it to enter the hammer's cock-notch, allowing the lower portion of the trigger to pivot forward somewhat. The slight forward motion of the trigger experienced at the point of full-cock should not be enough to bring the flat cam surface of the trigger back into contact with the cylinder stop tail.

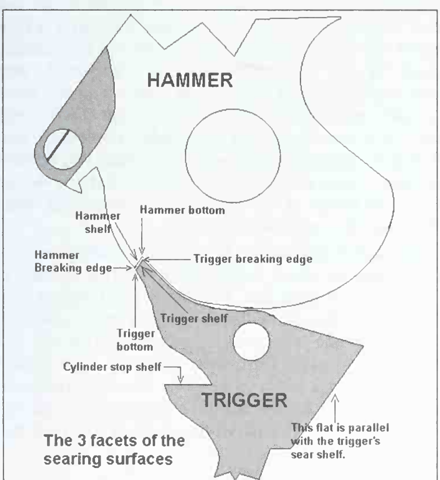


The illustration here shows an exaggerated Smith & Wesson single-action cylinder stop. The 'tail' or rear end of the cylinder stop is the point of adjustment which will affect cylinder stop timing. When the tail is too long, the stop may be held down slightly when the ham-

mer is cocked, preventing a complete lock-up. A long tail may also cause the stop to be pushed down farther than intended at cock, this adds unnecessary stresses to the cylinder stop spring. When the stop-tail is too short, the trigger might not be able to push the front or "locking bolt" portion of the stop down far enough to allow the cylinder to be released for rotation when the hammer is at the half-cock position.

The "locking bolt" of the cylinder stop is the front portion of the stop, the part which physically locks up into the cylinder's stop notches, and holds the cylinder at battery. If the cylinder is to be locked tightly at battery, the cylinder stop locking bolt must: A) be allowed to travel all the way up into the stop notches of the cylinder both with the hammer down, and when the hammer is fully cocked: B) should not exhibit much, if any side-to-side play within its window (opening) in the frame, and: C) should not have much, if any side-to-side play within the cylinder's stop notches. Oversized cylinder stops which are wider than standard are presently available from the parts department at Uberti USA.

A long time ago, Smith & Wesson's engineers designed the Model Number 3 single action so the flat area on the front of the hammer (in front of where the hand spring is located) was machined exactly parallel with the zero line at the hammer's full-cock sear. Thankfully, Aldo Uberti's factory has maintained that same relationship on its replicas as shown in the illustration, so if you place the hammer on a flat surface plate, take a pass with a pillar file, and then with a flat hard-Arkansas stone across the surface of the cock-notch shelf as shown; the hammer notch may be brought readily back to the zero angle. That operation will bring the hammer notch back to original S&W and Uberti specifications, no further alteration of the notch shelf or of its depth should be attempted.



The 3 facets of the searing surfaces

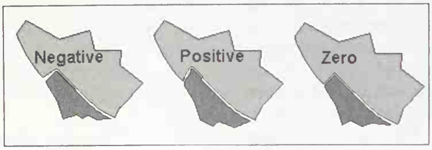
The hammer and trigger. The contact between the hammer's notch and the trigger's sear that holds the hammer at "full cock" (ready to fire) is known as 'sear-engagement'. Sear engagements are similar with most all firearms designs, that's especially true of those 19th century arms with exposed hammers. In simple terms; the factory has cut a notch into the hammer that is supposed to exactly match the shape of the trigger's sear tip. Whether or not a trigger sear engagement is safe and reliable will depend on the shapes and the angles at which the hammer notch and the trigger sear are machined, and that they have been matched as closely as possible. Achievement of this correct sear engagement, along with the removal of any "lost motion" within the mechanism makes up what is normally called a 'trigger job'. Factory hammer notches should never be altered by any means nor in any manner, the only exception being a small 'squaring operation' which would only remove burrs. Unless those hammer notches have already been damaged or altered (in which case the hammer should be replaced with a new-factory part), any and all fitting work in the searing areas should be performed only on the trigger sear.

We are out to achieve a safe, consistent and clean breaking trigger pull that falls in the area of four to five pounds, one with as little 'creep' as possible. To this end, any work you may have already performed in your efforts to eliminate "lost motion" in the pivots of the hammer and the trigger will surely ease the job ahead, so if you haven't already done so, take the steps now to remove all lost motion at the pivots of both parts. The achievement of that 'clean trigger break' and removing the 'creep' will both be affected by the shape of the trigger sear. Sometimes shooters may ask you for a three or even a two pound or less trigger pull but I strongly suggest that you adhere to a trigger pull in the four-to-five pound range. Hard experience has taught that very light triggers on firearms of this type can be an "accident just waiting to happen"; and I say that without regard to the competency of the shooter. Remember too, that many of these weapons rely on very heavy mainspring tension in order to work properly, couple that heavy spring with some rough and tumble against the clock and you could have real trouble. One of the gurus of Cowboy Action Shooting, Charly Gullett, also strongly recommends a four-to-five pound pull, especially if the revolver will ever be used in the bumps and grinds of mounted shooting events. As Charly says: "*In the case of mounted shooting, 3 lbs. on any trigger is entirely too light for hard riding*" and " *I personally prefer the feel of a cleanly breaking four (4) to five (5) pound trigger (even in the pedestrian matches)*[3]. This author is in strong agreement.

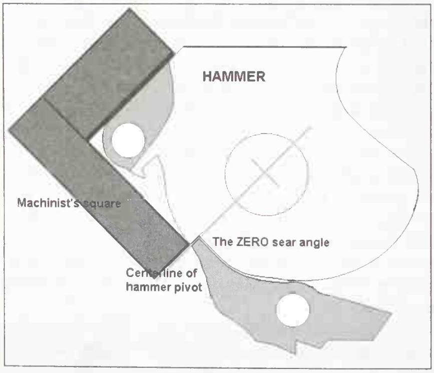
Let's have a close look at the shape of the top surface of the trigger's sear area. Factory new trigger sears will normally have a flat, squared shape here. The correct trigger sear will have three active facets, or surfaces; the shelf, the breaking edge or 'top', and the bottom. Those

three trigger sear facets need to correspond or mate with mirror image surfaces on the hammer's cock notch. Trigger "creep" would be the distance that the breaking edge of the trigger's sear has to travel along the shelf of the hammer in order to reach the breaking edge of the hammer notch so it can release the hammer. Break, or let-off is that point where the breaking edge of the trigger reaches the breaking edge of the hammer shelf; at this point it allows the hammer to fall. Ideally both breaking edges should be perfectly square and as sharp as knife blades.

The terms negative, positive and zeroed engagement are used to describe the relationships of the angles of contact between the trigger's sear and the hammer's cock-notch. Those terms offer descriptions that are based on the angle of these sear cuts relative to the center of the pivot point of the hammer.



Negative sear engagement: This leaves the trigger shelf at an angle from which the trigger sear may very easily disengage. You can see in the illustration that this angle is pointing off toward the rear of the hammer's pivot center. This gun's trigger pull will be extra light with a negative sear engagement, and may also be considered dangerous. In such a situation the hammer might not hold at full-cock, it may well fall of its own accord if the weapon is bumped, the condition will also cause the breaking edges of both hammer and trigger to wear at an abnormal rate and that will further increase the chances of an accidental discharge. A gunsmith should never, under any circumstance leave a negative sear angle in any firearm.



A zeroed sear engagement is one that offers a trigger sear and hammer notch that are perfectly squared, and parallel with one another. This angle of engagement will generally produce a good-to-very-good trigger pull, and one with a higher degree of safety than with a negative angle.

The positive sear engagement is one that occurs when the hammer notch shelf angle is actually angled toward the front of the hammer's pivot center. What happens when the trigger is pulled is the trigger sear's breaking edge actually lifts the hammer up, in so doing it has to overcome the full tension of the mainspring in order for it to move through the positive sear angle and reach the hammer's breaking edge. Positive sear angles are the safest, but they also produce the hardest trigger pulls, and you will easily understand this by examining the illustration. A factory-perfect trigger sear engagement is one with roughly 2 to 3 degrees of positive angle, this will leave a crisp and reasonably light let-off at the same time affording an extremely solid, safe engagement. As this positive angle is increased past 5 or even 10 degrees, the amount of effort required to overcome the 'over-engagement' becomes more than what would be called acceptable for any serious shooter, leaving a hard trigger "white knuckle" pull that won't allow the shooter to produce good accuracy with this revolver.

Shaping the trigger's sear: The Smith & Wesson and Uberti single action trigger sear is a very simple one to bring to the zero angle. These triggers have a machined shelf at the rear end, located just over the finger piece as shown in the illustration. It is this vertical surface that is just under the horizontal shelf that the trigger spring bears on. Conveniently but by design, this rear-shelf is machined at an angle that is already exactly parallel to the angle you want to end up with on the sear shelf. Placing the trigger on a square block so it is resting on this shelf, you can use a pillar file horizontally across the sear to cut a perfect zero angle on the sear shelf, and then finish and smooth it with a square hard-Arkansas stone. As a rule you should set the hammer notch at a zero angle, and then make your trigger sear shelf just a barely positive angle of perhaps one to three degrees. A note of caution: use care so that you do not reduce the length of the trigger sear by more than about .005" from the original length.

Hammer notch depth, from top to bottom should be a minimum of about twenty thousandth of-an-inch in order for it to hold, and to keep a good trigger sear engagement, though a depth of from thirty-to-thirty-five-thousandths of-an-inch is preferable. You will find the depth (thickness front to rear) of most Uberti Schofield trigger sears to be from about thirty-five to forty-thousandths deep. Should you encounter one that has been filed on already whose depth is less than say,

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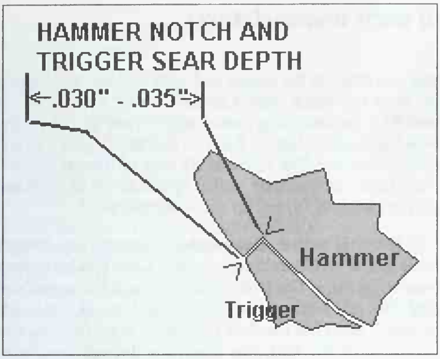
[3]. *Bullet 'N Press*, December 1997

thirty thousandths; such a trigger is weak and has been thinned to the point where it may have excessive creep: Discard it and replace with a new factory part.



A few words about the manufacturer and importer: Uberti USA and Navy Arms both cooperated generously in the preparation of this book. Firearms were provided by both Navy Arms and by Uberti USA. Factory parts, the parts pictures and technical information were provided by Uberti USA. In long experiences with each of these firms I have found them both to be very responsive to whatever problems or concerns about their products I have tried to point out along the way. Paul Reed of Navy Arms and Maria Uberti of Uberti USA have taken my suggestions of improvements back to the Aldo Uberti factory in Italy on more than one occasion. I believe, largely because of Paul and Maria's efforts to give their customer's a better product, that a good many improvements and alterations have been instituted in the Uberti production revolvers, and oversized service replacement parts such as hammers, hands and cylinder stops are now available to gunsmiths. Both companies have made it clear to this writer that they are enthusiastic about providing an excellent, shootable product to their customers, they offer friendly support, service, repair and parts departments which I would encourage gunsmiths and shooters to make use of.

Navy Arms/Uberti Schofield Disassembly Instructions

(part numbers refer to Uberti parts nomenclature)

1) Pull back on the Barrel Catch (Uberti calls this the "Stud Latch") #639, and tilt the revolver barrel all the way down to open the action thus exposing the rear of the cylinder (#5) chambers. **Check to be certain the cylinder is unloaded.**

2) To remove the Cylinder #5: Remove the rear screw from the Barrel Block #645(Cylinder Catch). Loosen the front screw on the Barrel Block and tilt the Barrel Block up slightly and pull the Cylinder #5 to the rear. The cylinder will withdraw off the Base Pin, toward the rear.

3) Barrel removal: Remove the Hinge Pin (Joint Pivot) Screw #215 from the left side of the hinge on the Frame #1, and use an appropriate straight punch to drive the Hinge Pin (Joint Pivot) #318 out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel #3 is now loose and may be lifted up out of its joint with the frame. The Extractor Cam #241 is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly. The extractor pawl is located in the frame bottom, just to the rear of the hinge ears. To remove the extractor pawl, simply drive out its retaining pin # and withdraw the extractor pawl along with its spring out through the frame bottom. (Note: when re-installing the barrel and extractor cam unto the frame, push up on the rear of the extractor pawl and hold it there until you have successfully re-installed the Hinge Pin. Make note of the small LUG on the Hinge Pin just under its head and its corresponding cut-out within its seat in the frame for re-assembly: The lug and its seat *must be aligned*.)

4) Grip and sideplate removal: Remove the Grip Screw #54 and the Grips #s 45 & 46. Remove the Stud Latch (Barrel Catch) screw #641. Bring the hammer back to the cock position and withdraw the Stud Latch (Barrel Catch) #639 from the top. Remove the two Sideplate Screws #s 37 & 453. Turn the frame on its side holding it by the hinge, sideplate facing up over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate #420 to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

5) Hammer removal: Use a pair of "spreader" pliers to compress the top of the Mainspring #20 so the hammer Stirrup #115 may be rotated forward, and jump out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw #53; located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring #20 from the frame side. Carefully rotate the top of the Hand #7 to the rear using a small screwdriver as a lever, and while holding the Hand to the rear; pull the Trigger #10 and hold it to the rear. The Hammer #2 may be rotated about 1/2 way back and carefully pulled upwards, off of its Hammer Pin (Stud) #178, and up out of the frame.

6) Internal action disassembly: Remove the Trigger Guard Screw #167 and remove the Guard #26 by pulling down on its front. The Bolt (Cylinder Stop) Spring #430 is fitted into, and held captive by a small dovetail slot inside the guard. Drift out the Bolt (Cylinder Stop) Pin (the forward-most of the two pins that pass through the frame from side to side) and push the Bolt (Cylinder Stop) #12 out toward the bottom, using a small punch through its window in the frame, under the area where the cylinder rotates. Drift out the Trigger Pin (the rear-most of the two pins that pass through the frame from side to side). The Trigger #10 may be pulled out the bottom of the frame. Trigger Spring #19 is mounted inside the front grip strap and is held in place by a cross-pin running through the grip frame. The hammer block safety and its spring rest in a mortice cut within the lock frame forward of the hammer stud and are simply lifted up and out of the frame, be sure to pay careful attention to their orientation for later re-assembly.

7) Barrel disassembly: The only part remaining on the barrel is the Barrel Block #645(Cylinder Catch). Remove the front barrel block screw and pull the barrel block off the barrel toward the rear. Re-insert the front barrel block screw into the barrel block while the gun remains apart so the two screws are not mixed up during assembly.

8) Cylinder disassembly: Insert six fired cartridge cases *or dummy cartridges* into the chambers for support. Push a punch through the hole in the Ejector Rod #421 and rotate the Cylinder #5 in a counter-clockwise direction to unscrew the Ejector Rod #421 from the Ejector (Extractor) #79.

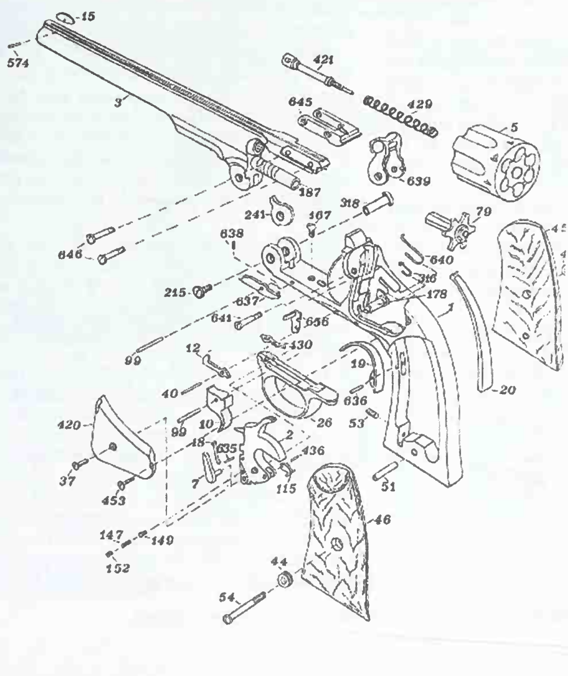
9) Hammer disassembly: Rotate the Hand #7, 180 degrees and pull it out of the Hammer. Drift out the pin in the center-front of the Hammer which holds in the Handspring #18, the Handspring now may be slid out of its recess in the hammer. The Hammer Stirrup #115 may be removed by drifting out its pin at the rear of the Hammer. NOTE the position of the Stirrup #115 for re-assembly. *Refrain from removing* the small screw located on the left side of the hammer; this screw is factory staked in place and it retains the hammer block safety cam.

Re-assemble the revolver in the reverse order of above.

Parts for the Navy Arms Schofield Revolver

1st numbers drawing# / 2nd numbers Uberti part#

1/850001 Frame assembly
2/850002 Hammer
3/850003 Barrel .45-7"
5/850005 Cylinder .45
7/850007 Hand
10/850010 Trigger
12/850012 Bolt
15/850015 Front Sight
18/850018 Handspring
19/850019 Bolt spring (trigger spring)
20/850020 Mainspring
26/850026 Trigger-Guard
37/850037 Hammer pin screw (center sideplate)
40/850040 Bolt Pin (Cylinder Stop Pin)
43/850043 Right grip nut
44/850044 Left grip nut
45/850045 Right grip
46/850046 Left grip
51/850051 Grip pin
53/850053 Mainspring screw (strain)
54/850054 Grip screw
79/850079 Ejector (extractor) .45
99/850099 Sight pin
115/850115 Stirrup
147/850147 Hammer safety spring
149/850149 Hammer safety pin
152/850152 Hammer safety stop screw
167/850167 Trigger-guard screw
178/850178 Hammer pin (hammer stud)
187/850187 Base pin bushing (base pin)
215/850125 Hinge pin screw (joint pivot screw)
241/850241 Ejector cam (extractor cam)
316/850316 Safety spring
318/850318 Hinge pin (joint pivot)
421/850421 Ejector rod
429/850429 Ejector spring
430/850430 Bolt spring
436/850436 Stirrup pin
453/850453 Sideplate screw (rear)
574/850574 Sight pin
635/850635 Handspring pin
637/850637 Ejector lever (extractor pawl)
638/850638 Ejector lever spring
639/850639 Stud latch (barrel catch)
640/850640 Stud latch spring
641/850641 Stud latch screw
645/850645 Barrel block (cylinder catch)
646/850646 Barrel block screw
656/850656 Safety bar



Navy Arms New Model Russian Disassembly Instructions

(refer to Navy Arms/Uberti parts nomenclature)

Note: *The Navy Arms New Model Russian differs mechanically from the original Smith & Wesson in several areas, in addition to a new hammer block safety device: the extractor mechanism in the Navy Arms revolver uses a more simplified extractor cam system like the Schofield instead of the rack and gear of the S&W 3rd Model Russian. The Navy Arms revolver also uses a hexagonal extractor shank in place of the squared original, and unlike the S&W revolver there is no "floor" in the barrel top-strap to support the Barrel Catch Cam and its spring, this function being taken over by the Cylinder Catch.*

1) Check to be certain the cylinder is unloaded: Lift up on the Barrel Catch (#8), and tilt the revolver barrel (#3) all the way down to open the action, thus exposing the rear of the cylinder (#14) chambers.

2) To remove the Cylinder (#14): With the barrel opened, loosen the Cylinder Catch Thumbscrew (#6) located on the barrel's top-strap about two full turns. Pull the Cylinder (#14) to the rear slightly, you will notice the Cylinder Catch (#7) has withdrawn slightly to the rear and has moved up, freeing the cylinder to be pulled all the way off the revolver straight toward the rear.

2a) When re-installing the Cylinder, push the Cylinder Assembly (#14) all the way forward onto the barrel, then push the Cylinder Catch (#7) all the way forward until you see its lip has locked over the rear edge of the cylinder, re-tighten the Cylinder Catch Thumbscrew (#6.)

3) Barrel removal: Remove the Hinge Pin (a.k.a. Joint Pivot) Screw (#21a) from the left side of the hinge on the Frame (#1), and use an appropriate straight punch to drive the Hinge Pin (Joint Pivot) (#21) out of the frame toward the right side. Make note of the witness mark on the Joint Pivot and its corresponding mark on the frame for re-assembly. The Barrel (#2) is now loose and may be lifted up out of its joint with the frame. The Extractor Cam (#19) is located between the "ears" of the barrel hinge and may be pulled down and out of the barrel. Make note of its position for re-assembly. If desired, the Extractor Pawl (#17) and its spring may be removed by drifting out its pin (located just behind the hinge, it is the forward-most pin in the frame.)

4) Grips and sideplate removal: Remove the Grip Screw (#46) and the Grips (#s 45L & 45R.) Remove the three Sideplate Screws (#s 40 and 41.) Turn the frame on its side holding it by the hinge, *sideplate facing up* over a padded surface. Strike the grip frame a sharp blow or two using a plastic mallet, this will cause the Sideplate (#39) to jump up out of its seat in the frame for removal. NEVER attempt to pry off the sideplate.

5) Mainspring and hammer removal: Use a pair of "spreader" pliers to compress the top of the Mainspring (#38) so the hammer Stirrup (#33) may be rotated forward, and out of its seat between the "ears" at the top of the mainspring. Loosen the Strain Screw (#27); located in the bottom-front of the front grip strap on the frame, and withdraw the Mainspring (#38) from the frame side. Carefully rotate the top of the Hand (#35) to the rear using a small screwdriver as a lever, and while holding the Hand to the rear; pull the Trigger (#30) and hold it to the rear. The Hammer (#32) may be rotated about way back and carefully pulled upwards, off of its Hammer Pin (Stud) (#42), and out of the frame. Carefully note the positions of the Hammer Block Safety and its Spring within the frame mortice (not illustrated), should these parts be removed for any reason, be certain to reinstall them in these exact positions.

6) Trigger guard removal: Remove the Trigger Guard Screw (#23) and remove the Guard (#43) by pulling down on its front and then sliding the guard forward until the rear comes out of its machined fit in the frame. The Bolt (a.k.a. Cylinder Stop) Spring (#24) is fitted into, and held captive by a small dovetail slot inside the guard.

7) Internal action disassembly: Drift out the Bolt (a.k.a. Cylinder Stop) Pin (this is the forward-most of the two pins that pass through the frame from side to side) and push the Bolt (#28) out toward the bottom using a small punch passing through its window in the frame, under the area where the cylinder rotates. Drift out the Trigger Pin (the rear-most of the two pins that pass through the frame from side to side). The Trigger (#30) may be pulled out the bottom of the frame. Trigger Springs (#30a) are mounted inside the front grip strap and are held in place by a cross-pin running through the grip frame.

8) Barrel disassembly: Remove the Barrel Catch Screw (#16) and pull the Barrel Catch (#8) out from the rear of the barrel's top-strap along with the Barrel Catch Cam (#9) and the Barrel Catch Cam Spring (#9a.) Next, remove the Cylinder Catch Thumbscrew (#6) from the top of the barrel's top-strap and pull the Cylinder Catch (#7) straight out the rear of the barrel top-strap, noting carefully its position for later reassembly. Re-assemble in the reverse order.

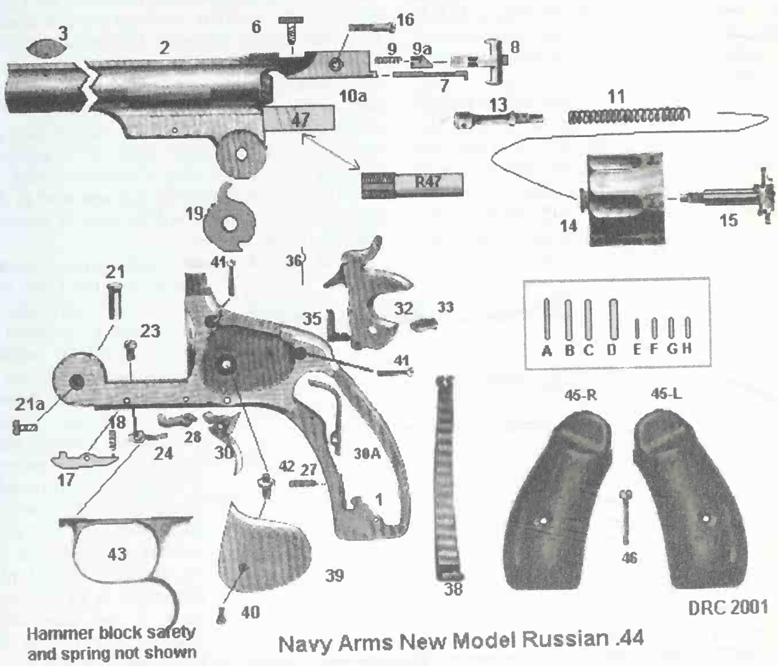
9) Cylinder disassembly: Insert six fired cartridge cases into the chambers for support. Push a straight punch through the hole in the Ejector Rod (#13) and rotate the Cylinder (#14) in a counter-clockwise direction to unscrew the Ejector Rod (#13) and its Spring (#11) from the Ejector (Extractor) (#15.)

10) Hammer disassembly: Rotate the Hand (#35), 180 degrees and pull it out of the Hammer. Drift out the pin in the center-front of the Hammer which holds in the Handspring (#36), the Handspring now may be slid out of its recess in the hammer. The Hammer Stirrup (#33) may be removed by drifting out its pin at the rear of the Hammer. NOTE the position of the Stirrup (#33) for re-assembly. ***NOTE:*** the small screw you see passing through the lower portion of the hammer just behind the hand is the actuator for the hammer block safety. This actuator screw is factory installed, staked in place and *should not be removed.*

Re-assemble the revolver in the reverse order of above.

Navy Arms Russian parts

1) Frame
2) Barrel
3) Front sight
F) Front sight pin
6) Cylinder catch thumb-screw
7) Cylinder catch
8) Barrel catch
9) Barrel catch cam spring
9a) Barrel catch cam
11) Extractor spring
13) Extractor rod
14) Cylinder
15) Extractor
16) Barrel catch screw
17) Extractor pawl
B) Pawl pin
18) Extractor pawl spring
19) Extractor cam
21) Joint pivot
21a) Joint pivot screw
23) Trigger guard screw
24) Cylinder stop (bolt) spring
27) Strain screw
28) Cylinder stop (bolt)
A) Cylinder stop pin
30) Trigger
30a) Trigger spring
C) Trigger pin
32) Hammer
33) Stirrup
H) Stirrup Pin
35) Hand
36) Hand spring
E) Hand spring pin
38) Mainspring
39) Sideplate
40) Plate screw, center
41) Plate screw, front or rear (2)
42) Hammer stud
43) Trigger guard
D) Grip pin
45L & 45R) Grips left and right
46) Grip screw
47) Base pin



Navy Arms New Model Russian .44

Starr Revolvers

Historical background. Starr percussion revolvers were one of the major brands of handguns purchased by the Union Army during the Civil War, in fact only Colt and Remington were more heavily purchased. The Starr Arms Company was based in New York with factories and offices in New York City, Binghamton and Yonkers. During the Civil War the Starr Arms Company sold percussion revolvers and both percussion and cartridge carbines designed by Ebenezer Starr to the Union forces. Ebenezer was the son of Nathan Starr of Middletown, Conn., a gunmaker of some repute and a former contractor of Model 1816 U.S. flintlock muskets.

Unlike most other American revolver makers, Starr introduced a double action revolver before it brought out its single action design. First appearing in the late 1850s, the double action Starr Model 1858 revolver was made available in a Navy Model of .36 caliber and an Army Model of .44 caliber. Both these self-cocking percussion revolvers had no single action capability and held six shots and had six inch round barrels with a loading lever mechanism mounted under the barrel. The Navy purchased 2,250[1] in .36 caliber and the Army bought roughly 23,000 of the .44 caliber version. A simplified and improved single action only Starr, the Model of 1863 was introduced as the replacement to the more complex and costly double action. About 32,000 of the single action Model 1863 were manufactured with eight inch barrels and government contracts accounted for approximately 25,000 of these.

The Starr's ungainly grip angle and unique jointed frame set it apart from any revolver before or since. The revolver frames were hinged at the lower front and held tegether at the rear by a large diameter thumbscrew in the form of a cross-bolt. Their barrels were screwed into the front portion of the lock frame. This was not a conventional top-break revolver, even though in fact, they broke apart in a similar fashion, the feature was intended more as an aid to cleaning the pistol since loading was accomplished in the normal percussion revolver fashion. Another truly unique feature of the Starr, especially considering the early period of its manufacture, was the use of detachable modular component systems like the single action's removable trigger guard assembly, today we might call this the "trigger group".

The ungainly Starr...

Historical background.
Safety notes. . .
Modern replicas.

Safety notes. . . From all outward appearances the Starr Civil War percussion revolvers were a big, robust design and these uniquely designed revolvers hold a fascination for many collectors. As with any firearms manufactured 130 years ago, we must exercise some caution in deference to the materials these guns were manufactured with. Colt and S&W, which were more common contemporaries of the Starr, both used steel forgings in the manufacture of their firearms. By using forgings instead of castings it meant that large amounts of expensive machine work were required to complete the parts that make up the firearm. On the good side, the forging process tended to cause the cast steel billets which they were formed from to become closely knit and thereby a much more homogenous steel alloy was formed, this also left the steel relatively free from impurities; by 1860s standards that is.

Starr, as well as a few other manufacturers, apparently used steel castings as the basis for their many of their large component parts. Steel castings required far less machine work, but they also tended be full of impurities and voids leaving flaws within the alloy itself. The alloy as cast was not nearly as closely knit, nor was it as homogenous as the forging. Modern technology, such as used by the Sturm, Ruger & Company, produces high tensile investment cast steel of a quality that is far superior even to that of the old forgings. Technology like this was not available to firearms makers of the 1860s. What we have with the Starr revolvers is a gun manufactured from very fragile materials. One must exercise special cautions when shooting an original Starr because of one other area, the cylinder chamber walls which are very thin, as you may easily see by examining the front face of the cylinder. Many of the .44 caliber Starr cylinders we have examined show signs of enlarging, and of cracking in this thin area. Couple that with the poor steel (by modern standards) that was used in their construction, and I think it will be easy to understand my warnings to be cautious.

Some Starr .44s were converted to cartridges in the years after the Civil War. It is these guns in particular that will be subject to potential damage from cartridges loaded with smokeless powder. We've seen more than a few of these conversions with ruined cylinders, so I must advise strongly against the use of any smokeless powder in a converted Starr revolver. Be aware that when Starr cylinders burst, they act very much like military fragmentation grenades by throwing jagged pieces of torn metal in all directions. The Starr is an interesting, and unique piece of our heritage, which you should be able to

enjoy for years into the future. If we always remember to stay within the physical limitations imposed by manufacturing technology, we will be able to preserve these great old guns for future generations to enjoy.

Modern replicas. Navy Arms have recently released replicas of both the double and the single action Starr percussion revolvers. Manufactured in Brescia, Italy by F. LLI Pietta, these .44 caliber revolvers appear to be made in a manner that is faithful to the original Starr designs, although the Pietta-made double action has something that only a very few of the originals did; a hammer that operates double and single action.

Starr revolvers require patience and care on the part of the shooter in order to be successfully operated but this is not necessarily the fault of the Italian manufacturer. If anything, we can see that the replica is made with much closer tolerances and its certainly constructed from a far higher grade of steel than the originals were. Starr's operating system design, although moderately successful, was just plain crude. Even when compared to an early Colt Paterson revolver the Starr mechanism isn't exactly what you could call smooth and sophisticated. Almost all Starr revolvers whether they are original or not, will often balk and hesitate while cocking, occasionally the cylinder will "throw by" the bolt and fail to lock. Of the two, the single action Model 1863 will prove the most dependable revolver and from what I can see, the Pietta copy is a much better gun in every respect except perhaps finish, than the original Starr revolver.

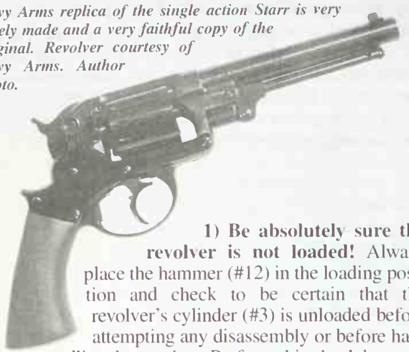
1. *Flayderman's Guide to Antique American Firearms*, 7th Edition by Norm Flayderman, 1998, Krause.

Takedown Instructions

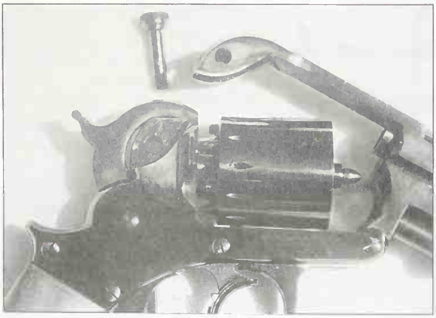
Pietta Model 1858 Starr Double Action
F. LLI Pietta nomenclature

Note: These instructions will also work with original 1858 Starr Double Action revolvers.

Navy Arms replica of the single action Starr is very nicely made and a very faithful copy of the original. Revolver courtesy of Navy Arms. Author photo.



1) Be absolutely sure the revolver is not loaded! Always place the hammer (#12) in the loading position and check to be certain that the revolver's cylinder (#3) is unloaded before attempting any disassembly or before handling the revolver. Perform this check by carefully examining the rear of the cylinder at each chamber to be certain that A) there are no percussion caps on any of the nipples. If percussion caps are present on the nipples you should consider this a loaded firearm; *do not attempt any further disassembly*, and B) you should always look at the front of the cylinder to make sure that there are no charges in the cylinder chambers (a good indication that a chamber is most likely loaded would be if bullets or balls are showing at the front end of the chamber). A loaded cylinder may be emptied by taking the gun to a range and firing it until it is empty or the cylinder may be carefully removed without firing the revolver in order to render the revolver itself safe for further operations by following the instructions at 2) above.



This is the first step to takedown the Starr. Once the takedown bolt has been the removed, while holding the cylinder rearward, the barrel may be broken down in a manner similar to a top-break. Once the barrel is all the way forward, the cylinder pulls off toward the front. Revolver courtesy of Navy Arms. Author photo.

2) Break apart the frames and remove the cylinder: Place the *hammer* (#12) in the safety position (pull it one click to the rear). Unscrew and remove the take-down bolt (#36) from the right side of the top frame (#1) Hold the cylinder (#3) to the rear by its sides and push down on the barrel (#25), this will cause the entire top frame and barrel assembly to hinge forward, continue to push the top frame-barrel until it is all the way open. The cylinder (#3) may now be withdrawn straight out to the front.

3) Cylinder disassembly: The only disassembly that will be required, or that is indeed possible on the *cylinder* (#3) would be the removal of the percussion nipples (#42) and this step should be accomplished with a special tool called a nipple wrench which is available from Navy Arms. Percussion nipples are screwed in and have right-hand threads, this means that they unscrew in a counter-clockwise direction. Original Starr and other vintage percussion revolvers may have nipples which have been hand fitted to each specific chamber and care should always be taken that these are re-installed in exactly the chamber they were removed from. Under normal circumstances there should not be a need to attempt to remove the cylinder hand locking screw (#38) or the cylinder hand (#5 a.k.a. ratchet teeth) from the rear of the cylinder. These parts should be left in place.

Starr upper and lower frames are parted by removing the hammer frames locking screw and pulling the two halves apart. Author photo.

4) Top frame and barrel removal and disassembly: Remove the hammer frames locking screw (#39) from the lower-front frame area where the top (#1) and bottom (#2) frames are jointed (this is the forward-most screw on the right side of the lower frame). The top and bottom frames may now be pulled apart, the barrel (#25) will stay with the top frame. Unlatch the loading lever (#28) by pulling back on the loading lever latch (#29) and pulling the lever down. Unscrew and remove the loading lever screw (#44) from the right side of the top frame and

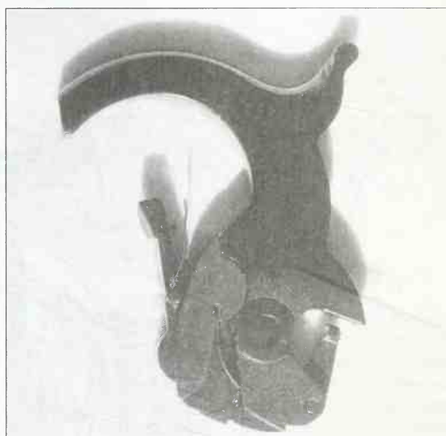
withdraw the loading lever assembly from the front. To remove the plunger (#32), remove the plunger screw (#35).

Removing these screws allows the grip and the back-strap to be removed. Author photo.

5) Grip, mainspring and hammer assembly: Remove the grip screw (#41) from the rear-lower portion of the backstrap (#10), also remove the grip locking screw (#40) this is the rear-most screw on the right side of the lower frame (#2). The grip (#11) and the backstrap (#10) may be withdrawn off the lower frame by pulling them down. The backstrap (#10) may now be lifted up out of the grip (#11). Remove the mainspring locking screw (#37) from the lower portion on the inside of the triggerguard (#6) and withdraw the mainspring (#20) out the rear, noting how its "ears" will have to engage the mainspring connecting rod (#18 a.k.a. stirrup) for reassembly. Remove the hammer frames locking screw (#39 a.k.a. hammer screw). Rotate the hammer (#12) to the rear and gently pull it straight up and out of the lower frame. The hand & spring (#13 & 14) and the hammer pivoting lever pin and hammer pivoting lever spring (#s 16 & 17) will withdraw with the hammer and are simply lifted off the hammer's side.

The entire trigger group drops out the bottom after taking out only two screws. Author photo.

6) Lower frame and triggerguard disassembly: Remove the triggerguard screw (#34) from the front of the triggerguard (#6) and then remove the lower grip locking screw (#40) this is the lowest screw on the right side of the lower frame.) The triggergaurd assembly will now drop out the bottom of the lower frame. The main trigger spring (#24) is now loose and may be lifted off the triggerguard, be sure that you note its position for later assembly. Remove the trigger spring locking screw (#33) from the top side of the triggerguard (#6), the secondary trigger spring (#9) may be lifted out, making note of its position for reassembly purposes. Drift out the trigger locking pin (#8) and the secondary trigger (#7) may be lifted out through the top of the triggerguard. Remove the last grip locking screw (#40) this is the screw at the center of the lower frame's right side) and the main trigger (#21) may be dropped out through the bottom of the lower frame. The safety spring (#22) may be removed from the main trigger by removing the safety spring screw (#23) and sliding the spring down off the main trigger.

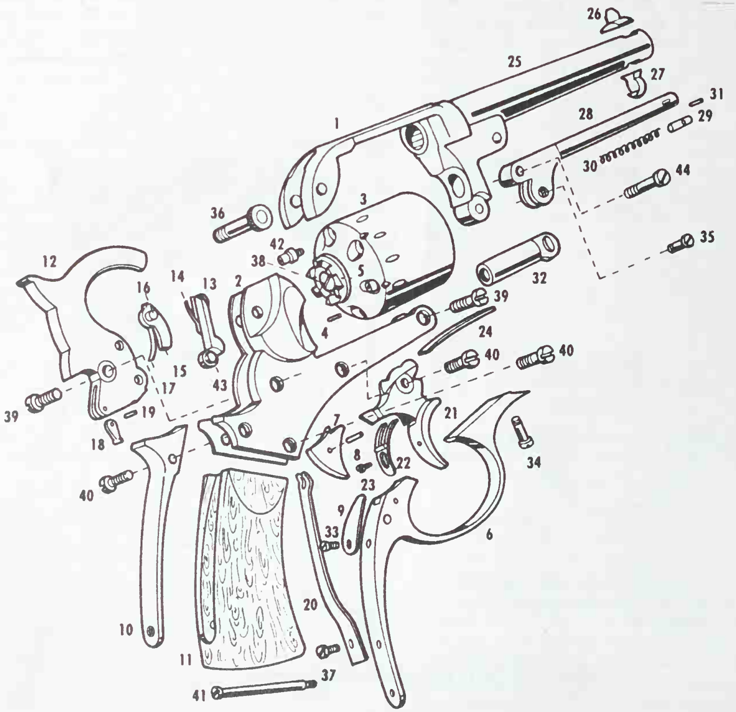


Starr's double action hammer showing the hand of the hammer pivoting lever (the DA sear), both parts simply lift out of the hammer with no tools. Author photo.

Reverse the above procedures for reassembly.

Pietta manufactured Starr Model 1858 Double Action parts

1. Top frame
2. Bottom frame
3. Cylinder
4. Cylinder hand locking pin
5. Cylinder hand
6. Triggerguard
7. Secondary trigger
8. Trigger locking pin
9. Secondary trigger spring
10. Backstrap
11. Grip
12. Hammer
13. Hand & spring
14. Hand spring
15. Hammer pivoting lever
16. Hammer pivoting lever pin
17. Hammer pivoting lever spring
18. Mainspring connecting rod
19. Mainspring connecting rod pin
20. Mainspring
21. Main trigger
22. Safety spring
23. Safety spring screw
24. Main trigger spring
25. Barrel
26. Sight
27. Barrel catch
28. Loading lever
29. Loading lever latch
30. Loading lever latch spring
31. Loading lever latch pin
32. Plunger
33. Trigger spring locking screw
34. Triggerguard screw
35. Plunger screw
36. Take-down bolt
37. Mainspring locking screw
38. Cylinder hand locking screw
39. Hammer to frames locking screw
40. Grip locking screw
41. Grip screw
42. Nipple
43. None
44. Loading lever screw



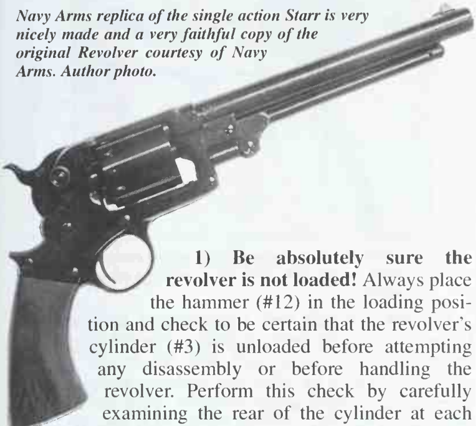
Takedown Instructions

Pietta Model 1863 Starr Single Action

F. LLI Pietta nomenclature

Note: These instructions will also work with original 1863 Starr revolvers.

Navy Arms replica of the single action Starr is very nicely made and a very faithful copy of the original Revolver courtesy of Navy Arms. Author photo.



1) Be absolutely sure the revolver is not loaded! Always place the hammer (#12) in the loading position and check to be certain that the revolver's cylinder (#3) is unloaded before attempting any disassembly or before handling the revolver. Perform this check by carefully examining the rear of the cylinder at each chamber to be certain that A) there are no percussion caps on any of the nipples. If percussion caps are present on the nipples you should consider this a loaded firearm; *do not attempt any further disassembly*, and B) you should always look at the front of the cylinder to make sure that there are no charges in the cylinder chambers (a good indication that a chamber is most likely loaded would be if bullets or balls are showing at the front end of the chamber). A loaded cylinder may be emptied by taking the gun to a range and firing it until it is empty or the cylinder may be carefully removed without firing the revolver in order to render the revolver itself safe for further operations by following the instructions at 2) below.

2) Break apart the frames and remove the cylinder: Place the *hammer* (#12) in the loading position (pull it one click to the rear) so that the cylinder will spin freely. Unscrew and remove the take-down bolt (#36) from the right side of the top frame (#1). Hold the cylinder (#3) to the rear by its sides and push down on the barrel (#25); this will cause the entire top frame and barrel assembly to hinge forward; continue to push the top-frame barrel until it is all the way open. The cylinder (#3) may now be withdrawn straight out to the front.

3) Cylinder disassembly: The only disassembly that will be required, or that is indeed possible on the *cylinder* (#3), would be the removal of the *percussion nipples* (#42) and this step should be accomplished with a special tool called a *nipple wrench* which is available from Navy Arms. Percussion nipples are screwed in and have right-hand threads; this means that they unscrew in a counter-clockwise direction. Original Starr and other vintage percussion revolvers may have nipples which have been hand fitted to each specific chamber and care should always be taken that these are re-installed in exactly the same chamber they were removed from. Under normal circumstances there should not be a need to attempt to remove the cylinder hand-locking screw (#38) or the cylinder hand (#5 a.k.a. ratchet teeth) from the rear of the cylinder. These parts should be left in place.

This is the first step to takedown the Starr. Once the takedown bolt has been removed, while holding the cylinder rearward, the barrel may be broken down in a manner similar to a top-break. Once the barrel is all the way forward, the cylinder pulls off towards the front. Revolver courtesy of Navy Arms. Author photo.

Starr upper and lower frames are parted by removing the hammer frames locking screw and pulling the two halves apart. Author photo.

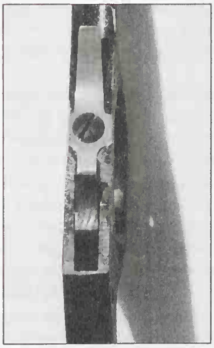
4) Top frame and barrel removal and disassembly: Remove the hammer frames locking screw (#39) from the lower-front frame area where the top (#1) and bottom (#2) frames are jointed (this is the forward-most screw on the right side of the lower frame). The top and bottom frames may now be pulled apart, the barrel (#25) will stay with the top frame. Unlatch the loading lever (#28) by pulling back on the loading lever latch (#29) and pulling the lever down. Unscrew and remove the loading lever screw (#44) from the right side of the top frame and withdraw the loading lever assembly from the front. To remove the plunger (#32), remove the plunger screw (#35).

Removing these two screws allows the grip and the backstrap to be removed. Author photo.

5) Grip and triggerguard removal: Remove the grip screw (#41) from the rear-lower portion of the backstrap (#10), also remove the grip locking screw (#40); this is the rear-most screw on the right side of the lower frame (#2). The grip (#11) and the backstrap (#10) may be withdrawn off the lower frame by pulling them down. The backstrap (#10) may now be lifted up out of the grip (#11.) Remove the mainspring locking screw (#37) from the lower portion on the inside of the triggerguard (#6) and withdraw the mainspring (#20) out the rear, noting how its "ears" will have to engage the mainspring connecting rod (#18 a.k.a. stirrup) for reassembly. Remove the triggerguard screw (#34) from the front of the triggerguard (#6) and then remove the lower grip locking screw (#40); this is the lowest screw on the right side of the lower frame). The triggergaurd assembly will now drop out the bottom of the lower frame.

The entire trigger group drops out the bottom after taking out only two screws. Author photo.

6) Lower frame and triggerguard disassembly: Remove the trigger spring locking screw (#33) from the top side of the triggerguard (#6), the trigger & bolt spring (#45) may be lifted out, making careful note of its position for reassembly purposes. Drift out the trigger locking pin (#8) and the trigger (#7) may be lifted out through the top of the triggerguard. Remove the last grip locking screw (#40); this is the screw at the center of the lower frame's right side and the bolt (#43) may be dropped out through the bottom of the lower frame. Remove the hammer frames locking screw (#39 a.k.a. hammer screw, this is the only remaining screw in the lower frame). Rotate the hammer (#12) to the rear and gently pull it down and out of the lower frame. The hand & spring (#13 & 14) will withdraw with the hammer and are simply lifted off the hammer's side.

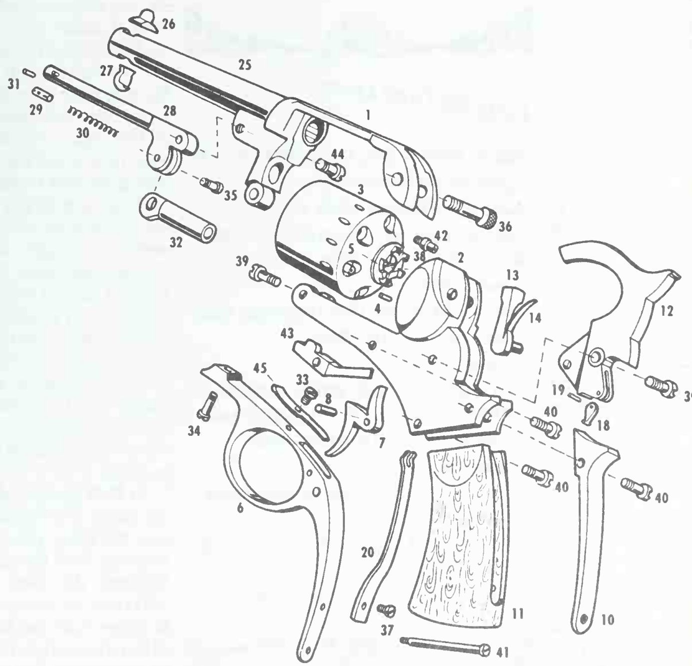


Starr's single action trigger guard viewed from the top. Removing the screw at the center allows the trigger spring to be removed. Author photo.

Reverse the above procedures for reassembly.

Pietta manufactured Starr Model 1863 Single Action parts

1. Top frame
2. Bottom frame
3. Cylinder
4. Cylinder hand locking pin
5. Cylinder hand
6. Triggerguard
7. Trigger
8. Trigger locking pin
9. None
10. Backstrap
11. Grip
12. Hammer
13. Hand & spring
14. Hand spring
15. None
16. None
17. None
18. Mainspring connecting rod
19. Mainspring connecting rod pin
20. Mainspring
21. None
22. None
23. None
24. None
25. Barrel
26. Sight
27. Barrel catch
28. Loading lever
29. Loading lever latch
30. Loading lever latch spring
31. Loading lever latch pin
32. Plunger
33. Trigger spring locking screw
34. Triggerguard screw
35. Plunger screw
36. Take-down bolt
37. Mainspring locking screw
38. Cylinder hand locking screw
39. Hammer to frames locking screw
40. Grip locking screw
41. Grip screw
42. Nipple
43. Bolt
44. Loading lever screw
45. Trigger & bolt spring



Chapter 6

Rifles

Marlin Model 1881 Takedown Instructions

Illustration from The Gun Digest Book of Exploded Firearms Drawings, 2nd edition, edited by Harold A. Murtz ©DBI Books Inc., 1977 Printed with permission of the publisher: Krause Publications, 700 E. State Street, Iola, WI 54990-0001.

1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then open the action by pulling the lever (#27) all the way down with your right hand. Check now to be absolutely certain there is no cartridge in the barrel's chamber nor laying in the carrier block (#40) within the action. *If there is a cartridge in the carrier block then when you close the lever, the rifle will be loaded.* To safely unload a rifle with a loaded magazine; always be sure the muzzle stays pointed in a safe direction so that if there were an accidental discharge no one would be injured. *Keep your finger away from the trigger* while you operate the lever to the fully open and fully closed positions several times to expel the cartridges in the magazine until no more cartridges are expelled from the action.

2) Remove the butt-stock and lever. Begin by removing the tang screw (#24), the butt-stock (not shown) may now be pulled straight back off the receiver (#1.) Remove the lever pin screw (#26) from the left side of the receiver and use a punch to drive out the lever pin (#28), the lever (#27) may be withdrawn by pulling it out the bottom of the receiver.

3) Action disassembly. Remove the hammer screw (#25) and use a pin punch to drive the trigger strap pin (#41) out of the receiver. The entire trigger-hammer assembly as a unit may be withdrawn by pulling the trigger strap (#29: the lower tang assembly) out through the bottom of the receiver. You may now pull the bolt assembly (#16) straight back to the rear and remove it from the receiver.

4) Magazine, forearm and loading port cover disassembly. Remove the forearm tip screw (#11) and the magazine tube stud screw (#6) and tilt the magazine tube (#7) down until it clears the magazine tube stud (#5), be aware that the magazine spring (#8) will be loose once the magazine tube clears the stud. (Note: we have encountered some 1881's with a separate magazine plug {not shown} at the end of the magazine tube however most that we have seen do not use one.) The entire magazine tube including the wooden forearm assembly and forearm tip may be withdrawn forward and off the rifle. Slide the loading port cover (#12) forward slightly and unscrew the cover spring guide (#14), remove the cover spring guide and the cover spring (#13) and the loading port cover (#12) can be slid forward out of its dovetailed mortise in the receiver.

5) Bolt disassembly. Drive out the firing pin retaining pin (#22) and the firing pin (#23) may be removed from the rear of the bolt. Remove the dust cover screw (#21) and the dust cover (#20) may be taken from the top of the bolt (#16.) The extractor (#18) can now be removed by first unscrewing the

Long on Long Guns

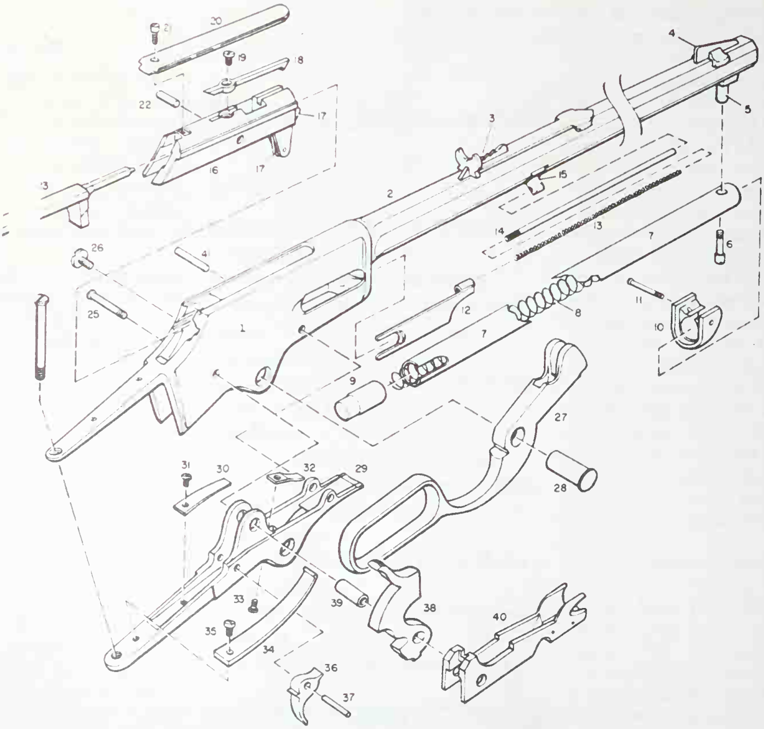
extractor screw (#19) out of the top of the bolt. The ejector (#17) is tightly stake-pinned in place and its removal is not suggested.

6) Trigger strap disassembly. With the hammer down all the way, remove the mainspring screw (#35) and lift the mainspring (#34) out of the trigger strap. Now remove the trigger spring screw (#31) and lift out the trigger spring (#30). Push out the hammer bushing (#39) and the hammer (#38) and the carrier block assembly (#40) may be lifted out toward the top of the trigger strap. The trigger is removed by first driving out the trigger pin (#37) and then lifting out the trigger (#36.)

Reassemble the rifle in the reverse order of the above procedure.

Parts Marlin Model 1881

1. Receiver
2. Barrel
3. Rear sight
4. Front sight
5. Magazine tube stud
6. Magazine tube stud screw
7. Magazine tube
8. Magazine spring
9. Magazine follower
10. Forearm tip
11. Foreend tip screw
12. Loading port cover
13. Cover spring
14. Cover spring guide
15. Cover spring abutment
16. Bolt
17. Ejector
18. Extractor
19. Extractor screw
20. Dust cover
21. Dust cover screw
22. Firing pin retaining pin
23. Firing pin
24. Tang screw
25. Hammer screw
26. Lever pin screw
27. Lever
28. Lever pin
29. Trigger strap
30. Trigger spring
31. Trigger spring screw
32. Lever spring
33. Lever spring screw
34. Mainspring
35. Mainspring screw
36. Trigger
37. Trigger pin
38. Hammer
39. Hammer bushing
40. Carrier block assembly
41. Trigger strap pin



Takedown Instructions

Marlin Model 1893 series rifles

Marlin parts nomenclature.

These instructions apply to early and late types of Marlin 1893 and 1894 models, but may also be used successfully with many other models of early production Marlin manufactured rifles.

1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then open the action by pulling the finger lever (#36-19) all the way down with your right hand. Check now to be absolutely certain there is no cartridge in the barrel's chamber nor laying in the carrier (#36-8) within the action. If there is a cartridge in the carrier block then when you close the lever, the rifle will be loaded. To safely unload a rifle with a loaded magazine; always be sure the muzzle stays pointed in a safe direction so that if there were an accidental discharge no one would be injured. Keep your finger away from the trigger while you operate the lever to the fully open and fully closed positions several times to expel the cartridges in the magazine until no more cartridges are expelled from the action.

2) Remove the lever, breech bolt and butt-stock. Open the finger lever (#36-19) about half way down and remove the finger lever screw (#36-23), pull the finger lever down and out of the receiver (#36-64). Push the breech bolt (#36-4) all the way to the rear and out of the receiver then lift out the ejector (#36-15.) Remove the tang screw (#36-66) from the upper receiver tang and pull the butt-stock (#36-7 not shown) straight off to the rear.

3) Receiver disassembly. Lower the hammer (#36-38) so it is all the way down. Remove the mainspring screw (#36-59) and lift out the mainspring (#36-55.) {New style: Push down on the top of the mainspring adjusting plate (#36-58) and slide the plate out to the side of the action along with the mainspring (#36-56.)} Remove the hammer screw (#36-42) and hold the trigger (#36-68) to the rear and lift the hammer assembly (#36-38) up out of the top of the receiver. Remove the trigger guard plate screw (#36-75) from the bottom-front of the trigger guard and the trigger guard plate support screw (#36-76) from the left side of the receiver, the trigger guard plate assembly (#36-74) may now be pulled down out of the receiver. By removing the carrier screw (#36-9) from the right side of the receiver the carrier (#36-8) and the locking bolt (#36-45) may be removed from the bottom of the receiver. Make careful note of the relationship of these parts for later reassembly. Unscrew and remove the loading spring screw (#36-44) and the loading spring (#36-43) can be lifted out of the receiver.

4) Forearm and magazine disassembly. *Note:* Marlin has used several methods of securing the magazine and forearm over the years so depending on which model you have, you may note some differences; the following procedure applies to the rifle and sporting carbine, while standard carbine parts are shown in the illustration: Remove the two screws (#36-79) from the forearm tip (#36-77) and slide the forearm tip forward. Unscrew magazine tube plug screw (#36-51) from the bottom-front of the magazine tube. Tilt the magazine tube (#36-46) down from the barrel slightly so it clears the magazine tube stud (#36-52) and withdraw the magazine tube plug (#36-50) along with the magazine spring (#36-54) and magazine tube follower (#36-48) can now be withdrawn from the front of the magazine tube (#36-46); the magazine tube may also be withdrawn. Tilt the forearm (#36-29; not shown) down and remove it forward.

5) Trigger guard plate disassembly. Make note of the relative positions of these parts before disassembly. Remove the trigger spring screw (#36-71) and lift out the trigger spring (#36-70.)

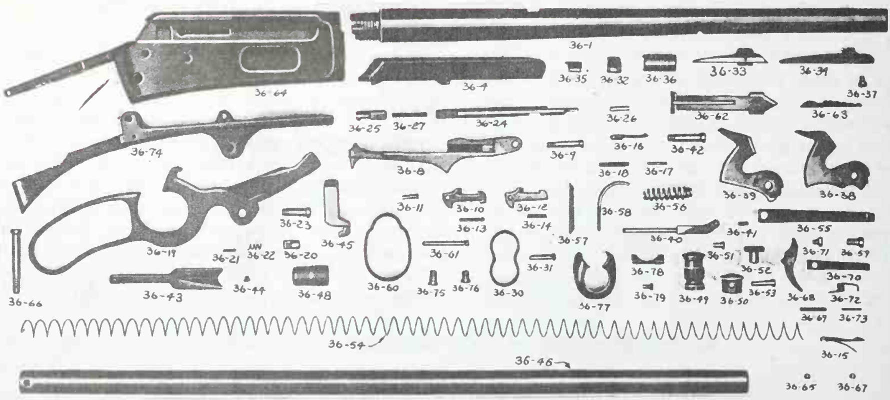
Drive out the trigger pin (#36-69) and lift out the trigger (#36-68) {New style: Drive out the trigger spring pin (#36-73) and the trigger spring (#36-72) may be removed from the trigger guard plate; drive out the trigger pin (#36-69) and lift out the trigger (#36-68.)}

6) Breech bolt and lever disassembly. The extractor (#36-15) may be removed from the breech bolt (#36-4) by drifting out the extractor pin (#36-17) and carefully prying it forward out of its slot in the bolt face. Remove the two firing pin retaining pins (#36-26) by drifting them out from top to bottom and the rear firing pin (#36-25) and the firing pin spring (#36-27) may be removed followed by the front firing pin (#36-24) which will now slide out to the rear of the breech bolt. Finger lever (#36-19) disassembly; the finger lever plunger (#36-20) and its spring (#36-22) may be removed by drifting out the finger lever plunger pin (#36-21.)

Reassemble the rifle in the reverse order of the above procedure.

Parts for Marlin Models 1893, 1894, 36, 36A, 1936 Marlin added the pre-fix "36-" to all numbers below

1 Barrel
4 Breech bolt
5 Buttplate
6 Buttplate screw
7 Butt-stock
8 Carrier
9 Carrier Screw
10 Carrier rocker (OS)
11 Carrier rocker rivet
12 Carrier rocker (NS)
13 Carrier rocker spring (OS)
14 Carrier rocker spring (NS)
15 Ejector with spring
16 Extractor
17 Extractor pin
18 Extractor spring
19 Finger lever
20 Finger lever plunger
21 Finger lever plunger pin
22 Finger lever plunger spring
23 Finger lever screw
24 Firing pin, front
25 Firing pin, rear
26 Firing pin retaining pin
27 Firing pin spring
29 Forearm, rifle
30 Front band, carbine
31 Front band screw
32 Front sight, carbine
33 Front sight ramp (OS)
34 Front sight ramp (NS)
35 Front sight ramp insert
36 Front sight ramp hood
37 Front sight ramp screw
38 Hammer (OS)
39 Hammer (NS)
40 Hammer rod (NS)
41 Hammer rod pin
42 Hammer screw
43 Loading spring
44 Loading spring screw
45 Locking bolt
46 & 47 Magazine tube
48 Magazine tube follower
49 Magazine tube plug, carbine
50 Magazine tube plug, rifle
51 Magazine tube plug screw
52 Magazine tube stud
53 Magazine tube stud screw
54 Magazine tube spring
55 Mainspring flat
56 Mainspring coil
57 Mainspring adjusting plate (OS)
58 Mainspring adjusting plate (NS)
59 Mainspring screw
60 Rear band, carbine
61 Rear band screw
62 Rear sight
63 Rear sight elevator
64 Receiver
65 Receiver dummy screw
66 Tang screw
67 Tang dummy screw
68 Trigger
69 Trigger pin
70 Trigger spring (OS) flat
71 Trigger spring screw
72 Trigger spring (NS)
73 Trigger spring pin
74 Trigger guard plate
75 Trigger guard plate screw
76 Trigger guard plate support screw
77 Forearm tip, rifle
78 Forearm tip tenon
79 Forearm tip tenon screw



Takedown Instructions

Marlin Model 336 series rifles

Illustration from The Gun Digest Book of Exploded Firearms Drawings, 2nd edition, edited by Harold A. Murtz ©DBI Books Inc., 1977 Printed with permission of the publisher: Krause Publications, 700 E. State Street, Iola, WI 54990-0001 Phone 800 258-0929

These instructions apply to Marlin 336 models, but may be used with many other models of modern production Marlin manufactured rifles.

1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then open the action by pulling the finger lever (#34) all the way down with your right hand. Check now to be absolutely certain there is no cartridge in the barrel's chamber nor laying in the carrier (#22) within the action. If there is a cartridge in the carrier block, then when you close the lever, the rifle will be loaded. To safely unload a rifle with a loaded magazine; always be sure the muzzle stays pointed in a safe direction so that if there were an accidental discharge no one would be injured. Keep your finger away from the trigger while you operate the lever to the fully open and fully closed positions several times to expel the cartridges in the magazine until no more cartridges are expelled from the action.

2) Remove the lever, breech bolt and butt-stock. Open the finger lever (#34) about half way down and remove the finger lever screw (#38), pull the finger lever down and out of the receiver (#1). Push the breech bolt (#3) all the way to the rear and out of the receiver then lift out the ejector (#25.) Remove the tang screw (#15) from the upper receiver tang and pull the butt-stock (#55 not shown) straight off to the rear.

3) Receiver disassembly. Lower the hammer (#9) so it is all the way down. Push down on the top of the mainspring adjusting plate (#13) and slide the plate out to the side of the action along with the mainspring (#12.) Remove the hammer screw (#14) and after depressing the trigger safety block (#28), hold the trigger (#28) to the rear and lift the hammer assembly (#9) up out of the top of the receiver. Remove the trigger guard plate screw (#17) from the bottom-front of the trigger guard and the trigger guard plate support screw (#18) from the left side of the receiver, the trigger guard plate assembly (#16) may now be pulled down out of the receiver. By removing the carrier screw from the right side of the receiver the carrier (#22) and the locking bolt (#24) may be removed from the bottom of the receiver. Make careful note of the relationship of these parts for later reassembly. Unscrew and remove the loading spring screw (#27) and the loading spring (#26) can be lifted out of the receiver.

4) Forearm and magazine disassembly. *Note:* Marlin has used several different methods of securing the magazine and forearm over the years so you may note some variances, the following procedure applies to the carbine: Remove the magazine tube plug screw (#49) from the bottom-front of the magazine tube. The magazine tube plug (#48) along with the magazine spring (#47) and magazine tube follower (#46) can now be withdrawn from the front of the magazine tube (#45.) Unscrew the front band screw (#44) and slide the front magazine band (#43) off from the front. Remove the rear band screw (#51) and slide the forearm wood along with the band up the barrel just a little, remove the magazine tube (#45) by pulling it forward, then slide the rear band off and tilt the forearm down and remove it.

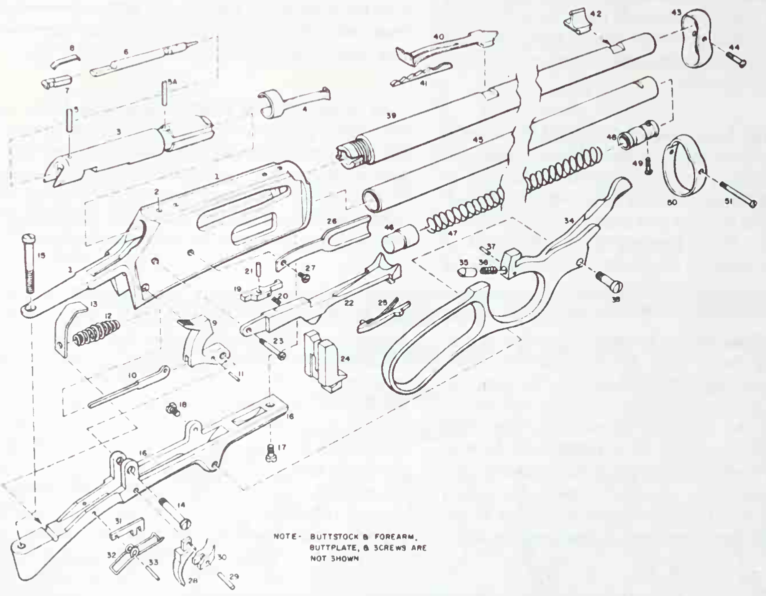
5) Trigger guard plate disassembly. Make note of the relative positions of these parts before disassembly. Drive out the trigger pin (#29) and the trigger (#28) and sear (#30) may be removed from the trigger guard plate. To remove the trigger safety, first drift out the trigger safety block pin (#33) and the trigger safety block (#31) and its spring (#32) may be lifted out the top.

6) Breech bolt and lever disassembly. The extractor (#4) may be removed from the breech bolt (#3) by carefully prying it out of its slot to the side using a small screwdriver for leverage. Remove the rear firing pin retaining pin (#5) by drifting it out from top to bottom and the rear firing pin (#7) and the firing pin spring (#8) may be removed. The front firing pin (#6) is removed by first driving out the front firing pin retaining pin (#5a), the firing pin will now slide out to the rear of the breech bolt. Finger lever disassembly; the finger lever plunger (#35) and its spring (#36) may be removed by drifting out the finger lever plunger pin (#37.)

Reassemble the rifle in the reverse order of the above procedure.

Parts for Marlin Model 336

1. Receiver
2. Dummy screws
3. Breech bolt
4. Extractor
5. Rear firing pin Rtg. Pin, long
6. Front firing pin
7. Rear firing pin
8. Firing pin spring
9. Hammer
10. Hammer rod
11. Hammer rod pin
12. Mainspring
13. Mainspring adjusting plate
14. Hammer screw
15. Tang screw
16. Trigger guard plate
17. Trigger guard plate screw
18. Trigger guard plate support screw
19. Carrier rocker
20. Carrier rocker spring
21. Carrier rocker rivet
22. Carrier
23. Carrier screw
24. Locking bolt
25. Ejector with spring
26. Loading spring
27. Loading spring screw
28. Trigger
29. Trigger pin
30. Sear
31. Trigger safety block
32. Trigger safety block spring
33. Trigger safety block pin
34. Finger lever
35. Finger lever plunger
36. Finger lever plunger spring
37. Finger lever plunger pin
38. Finger lever screw
39. Barrel
40. Rear sight
41. Rear sight elevator
42. Front sight
43. Front band
44. Front band screw
45. Magazine tube
46. Magazine tube follower
47. Magazine spring
48. Magazine tube plug
49. Magazine tube plug screw
50. Rear band
51. Rear band screw



MARLIN MODEL 336

The Remington Rolling Block Rifle

A short history

One of the most recognizable and popular of the 19th century rifle designs, the Remington Rolling Block was produced in many forms from 1864 up to as late as 1934. This successful design was best known for its utter simplicity and reliability. The total quantities of this design manufactured are not exactly known, but the number is huge. In military rifles and carbines alone, from 1867-1902 more than a million arms were manufactured. The list of countries who bought the rifle is also rather impressive, these include Argentina, Chile, China, Columbia, Cuba, Denmark, Egypt, France, Honduras, Mexico, Norway, Spain, Sweden, the United States and others; rolling block rifles literally covered the globe.

Remington's classic Rolling Block was used all over the world, over a million military rifles and carbines were made and it fought in many 19th century wars. From the Ed "Buddy" Wade collection. Author photo.

Remington's rolling block action was manufactured as a rifle, carbine, shotgun and even a single shot pistol, and was made available in both military and sporting configurations. During its long and colorful life, the ever-faithful rolling block was chambered in just about every black powder cartridge known to man. It was even offered in an early version of the smokeless 7x57mm Mauser as the No.5 Action for the Spanish, and in 8mm Lebel for the French. The rolling block's action design, where the hammer serves to effectively lock the breech block closed, was originally patented by Leonard Geiger in 1863. Joseph Rider, the genius of Remington's Ilion, NY factory improved Geiger's action and developed the split-breech carbine. Working together, Geiger and Rider perfected the design into the Remington Rolling Block in 1866 and further improved it by patent in August of 1867, and again in November of 1871.[1]

Still going strong, the rolling block is being produced today. This one is by Navy Arms (made by Pietta) and here in the USA by Remington. Rifle courtesy of Navy Arms. Author photo.

For ease of identification, there are four basic rolling block frame sizes, as follows:

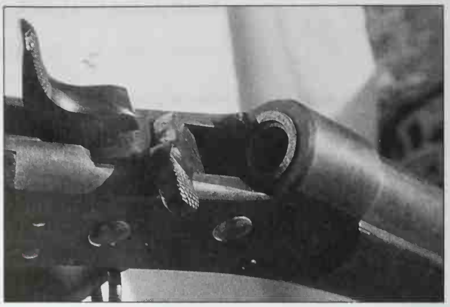
No. 1 action- 1.250" wide. This is the largest of the rolling block actions, intended for military use, it was used for the largest and most powerful cartridges. Also used on Remington's Model No. 1 rifle.

No. 2 Action- 1.125" wide. Used for smaller, less powerful cartridges. Identified by the curved contour at the rear where it joins to the stock.

No. 3 Action- Not actually a rolling block at all but rather a falling block, this was the Remington-Hepburn action.

No. 4 Action- A short, lightweight action used for rimfire calibers. Its forward end is much narrower than the larger actions.

The rolling block's trigger guard bow was substantial, like the rest of the rifle it was rugged, built for heavy military service. Author photo.



One of the reasons for the great popularity enjoyed by the Remington rolling block design was its pure simplicity. To open the breech you pulled back the hammer, then you pulled back the breech block, which fully exposed the chamber. The rifle shown is a U.S. Model of 1871 in 50 caliber made at the Springfield Armory. From the Ed "Buddy" Wade collection. Author photo.

A closer look at the Navy Arms rolling block replica shows very good attention to detail. Even after 125 plus years, the rolling block rifle has plenty of sex appeal left. Rifle courtesy of Navy Arms. Author photo.

No. 5 Action- This was the No.1 Action made starting in 1898 for use with smokeless powder cartridges, it was equipped with a rimless cartridge case extractor and was the last of the big framed military rolling block actions.

1. Remington Rolling Block Pistols. Jerry Landskron 1981. Rolling Block Press
2. Remington Firearms: The Golden Age of Collecting. Robert D. Ball 1995. Krause Publications

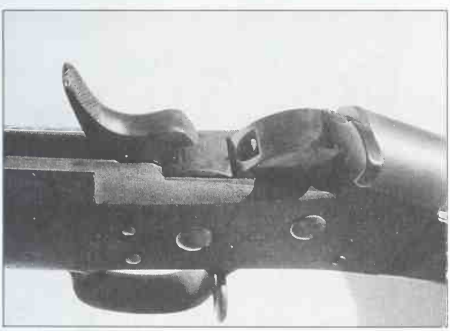
Remington Rolling Block Rifle

Takedown Instructions

Illustration from The Gun Digest Book of Exploded Firearms Drawings, 2nd edition, edited by Harold A. Murtz ©DBI Books Inc., 1977 Printed with permission of the publisher: Krause Publications, 700 E. State Street, Iola, WI 54990-0001 Phone 800 258-0929

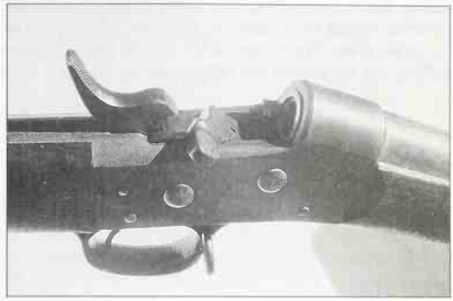
These instructions are applicable to almost all large frame Remington rolling block rifles and copies thereof, excepting the Model 1869 US Navy rifle.

When the hammer is all the way down, its massive underside rolls under, and thereby effectively blocks the breech block from opening.



To open the rolling block the hammer must first by pulled back, this unlocks the breech block.

1) Unload! Keep your fingers away from the trigger at all times. Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then open the action by pulling the hammer (#32) all the way to the rear, and then pulling back the breech block (#27) lever all the way to "roll" the breech open. Look into the barrel and check to be absolutely certain there is no cartridge in the barrel's chamber. If there is a cartridge present; reach in and manually remove it by pulling the cartridge straight out of the rear of the barrel.



The opened rolling block exposes the back of the barrel for loading, it also prevents the hammer from falling.

2) Action disassembly: Remove the button screw (#34) and the Button (#33) from the left receiver side. Cock the hammer (#32) and then push the breech block pin (#31a) out of the receiver (#1) from right to left. The breech block (#27) and the extractor (#30) may be lifted out from the top. By drifting out the firing pin retaining pin (#29) from the breech block, the firing pin (#28) may be pulled out the rear of the breech block. Hold the hammer (#32) with your thumb and pull the trigger (#26), allowing the hammer to ease all the way forward. Remove the hammer pin (#31b) and the hammer may now be lifted up out of the receiver.

At center photo is the "button screw"; removing it allows the button to be lifted out, freeing the large breech block and hammer pins. On either side of the large pins are the guard plate screws which after the tang screw and butt-stock have been removed, you would remove in order to take the guard plate out the bottom of the action.

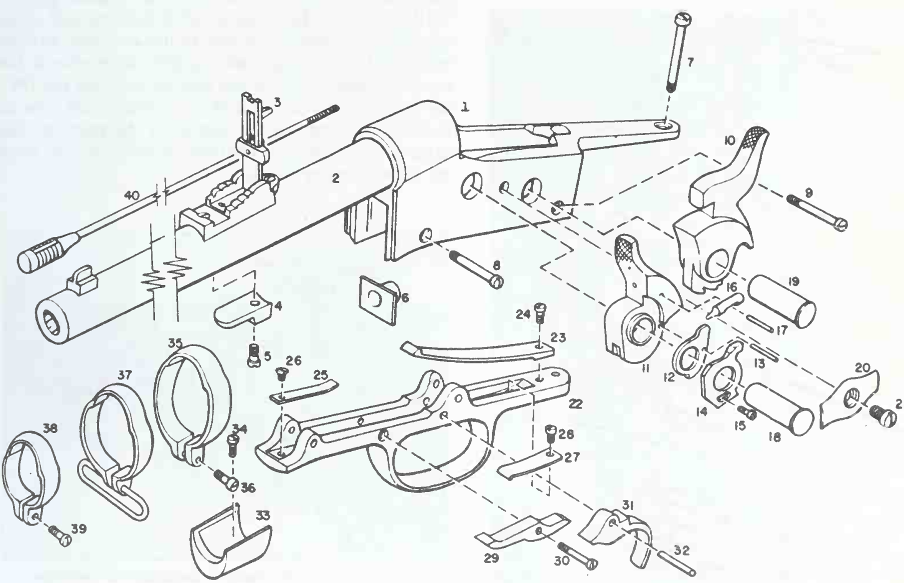
3) Butt-stock, guard plate and further disassembly: After removing the tang screw (#35), the butt-stock can be pulled straight off to the rear. Remove the front (#16) and rear (#17) guard plate screws and the guard plate (#15) may be pulled straight down and out of the receiver. The mainspring (#20) may now be removed after removing its screw (#21), then the trigger spring screw (#23) and trigger spring (#22) may also be withdrawn. Once the lever spring screw (#19) is removed, the lever spring (#18) may be lifted out of the front of the guard plate. The trigger (#26) may be removed after drifting out the trigger pin (#26a) and the locking lever (#24) is withdrawn after removing the locking lever screw (#25) from the left side of the guard plate.

4) Forearm wood removal: On military rolling block models the forearm may be removed by first unscrewing and removing the ramrod and then removing all the barrel bands. On some sporting carbines and rifles the forearm wood may be retained by one or more machine screws, accessible from the underside of the forearm wood, which are threaded into a barrel tenon(s).

Reassemble in the reverse order of above.

Parts for the Remington rolling block rifle

1. Receiver
2. Barrel
3. Rear sight
4. Recoil stud
5. Recoil stud screw
6. Ramrod stop
7. Tang screw
8. Front guard plate screw
9. Rear guard plate screw
10. Hammer
11. Breech block
12. Firing pin retractor
13. Retractor pin
14. Extractor
15. Extractor screw
16. Firing pin
17. Firing pin limit pin
18. Breech block pin
19. Hammer pin
20. Button
21. Button screw
22. Guard plate
23. Mainspring
24. Mainspring screw
25. Lever spring
26. Lever spring screw
27. Trigger spring
28. Trigger spring screw
29. Locking lever
30. Locking lever screw
31. Trigger
32. Trigger pin
33. Stock tip
34. Stock tip screw
35. Rear band
36. Rear band screw
37. Middle band & screw
38. Front band
39. Front band screw
40. Ramrod



Sharps Model 1874 Rifle

Takedown Instructions

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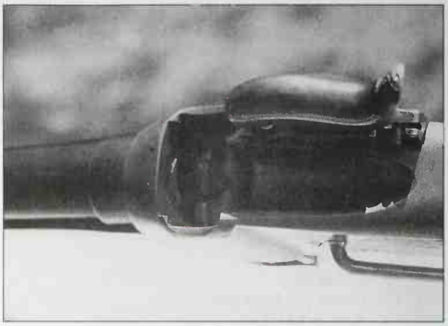
Note: The following disassembly procedures will work well for most of the earlier side-hammer Sharps rifles and carbines manufactured from 1851 on, including their percussion models.

1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then pull back the hammer one "click", and open the action by pulling the lever (#14) all the way down with your right hand. Look into the barrel and check to be absolutely certain there is no cartridge in the barrel's chamber. If there is a cartridge present; reach in and manually remove it by pulling the cartridge straight out of the rear of the barrel.

To check the chamber, first pull back the hammer one "click".



Open the breech-block by dropping the lever to make certain the gun is empty.

2) Disassembling the action. Remove the two lock plate screws (#46) from the left side of the receiver (#8) and slowly pull the lock plate assembly (#26) out from the right side. Push in the lever pin retainer plunger (#10: located on the forward end of the right side of the receiver) and rotate the handle of the lever pin (#9) forward until the lever pin unlocks from its mortice in the receiver. Open the lever and remove the lever pin (#9), the lever and breechblock (#18) assembly can now be pulled down and out the bottom of the receiver. The extractor (#13: metallic cartridge models) may be lifted out of the receiver bottom.

It doesn't matter if the Sharps is percussion or cartridge, this part is the same. Push in on the tiny button on the front-right side of the action, just in front of the lever pin. This will allow you to turn the lever pin twoard the front, unlocking its lower-rear portion from its seat with the frame. From the collection of Ed "Buddy" Wade. Author photo.

3) Removing the stocks. Remove the forearm screws (#s 3 & 4) and pull the forearm down and off the barrel. (On military models: depress the band spring (s) and slide the band (s) forward off the barrel; the forearm may now be removed.) Remove the guard plate stock screw (#38) and the guard plate receiver screw (#39) from the guard plate. Now remove the front (#35) and rear (#36) guard plate screws from the top receiver tang. Carefully pull the butt-stock toward the rear until it and the guard plate (#37) come loose and may be removed. The guard plate may be pulled down out of the butt-stock.

4) Lock plate disassembly. The hammer (#24) should be all the way forward. Use a mainspring vise or a small "C" clamp to compress the mainspring (#34) enough so the stirrup (#31) can be rotated out of the mainsprings "ears", remove the mainspring screw (#33) and the mainspring may now be pulled off the rear of the lock plate. Remove the tumbler screw (#25) from the center of the hammer (#24) and pull off the hammer. Next remove the three bridle screws (#29) and the bridle (#28), the tumbler (#27) and the sear (#32) may all be lifted off the rear face of the lockplate. Make note of their positions for reassembly.

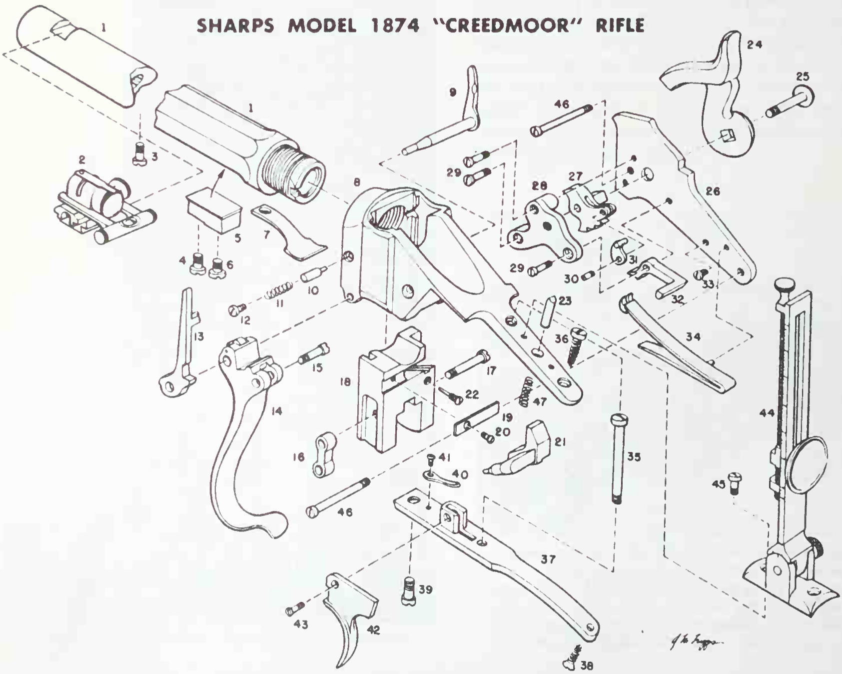
5) Breech bolt disassembly. The lever (#14) may be removed by unscrewing the lever toggle link screw (#15) and pulling the lever down away from the breech-block (#18.) The lever toggle link (#16) may be removed by first removing the upper toggle link screw (#17.) On cartridge models, the firing pin screw (#22) and the firing pin plate screw (#20) are removed, the firing pin plate (#19) may be slid off the breechblock and the firing pin (#21) is lifted out from the rear.

6) Peripheral disassembly. Remove the lever spring screw (#6) from the barrel underside and the lever spring (#7) will come off. The guard plate; remove the trigger spring screw (#41) and the trigger spring (#40.) The trigger (#42) is removed by first removing the trigger screw (#43), the trigger will drop out from the bottom.

Reassemble in the reverse order of above.

Parts for the Sharps side hammer cartridge rifles

1. Barrel
2. Front sight
3. Front foreend screw
4. Rear foreend screw
5. Barrel stud
6. Lever spring screw
7. Lever spring
8. Receiver
9. Lever pin
10. Lever pin retainer plunger
11. Lever pin retainer plunger spring
12. Lever pin retainer plunger spring screw
13. Extractor
14. Lever
15. Lever toggle link screw
16. Lever toggle link
17. Upper toggle link screw
18. Breechblock
19. Firing pin plate
20. Firing pin plate screw
21. Firing pin
22. Firing pin screw
23. Rear sight detent
24. Hammer
25. Tumbler screw
26. Lock plate
27. Tumbler
28. Bridle
29. Bridle screw
30. Stirrup screw
31. Stirrup
32. Sear
33. Mainspring screw
34. Mainspring
35. Front guard plate screw
36. Rear guard plate screw
37. Guard plate
38. Guard plate stock screw
39. Guard plate receiver screw
40. Trigger spring
41. Trigger spring screw
42. Trigger
43. Trigger screw
44. Rear sight assembly
45. Rear sight mounting screws
46. Lock plate screws
47. Rear sight detent spring



U.S. Springfield Model 1873 Rifle

Takedown Instructions

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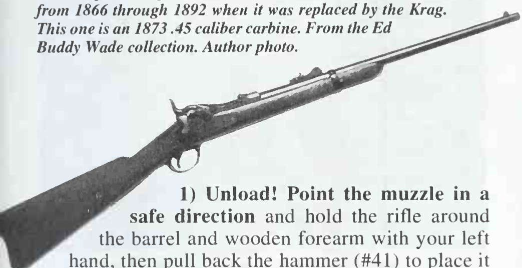
Note: The following disassembly procedures will work well for all of the U.S. Springfield rifles and carbines using the trap-door system.

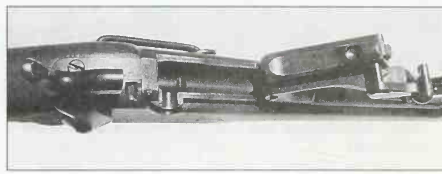
The "trapdoor" Springfield was the mainstay of the U.S. Army from 1866 through 1892 when it was replaced by the Krag. This one is an 1873 .45 caliber carbine. From the Ed Buddy Wade collection. Author photo.



1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then pull back the hammer (#41) to place it in the half-cock position and open the action by lifting the thumb piece (#15) to unlatch the breech block (#10) which is then tilted all the way up with your right hand. Look into the barrel and check to be absolutely certain there is no cartridge in the barrel's chamber. If there is a cartridge present; reach in and manually remove it by pulling the cartridge straight out of the rear of the barrel.

Close-up of the lock side of the Springfield rifle.

Once the hammer has been pulled back out of the way, lift the thumbpiece to unlatch the breech block.

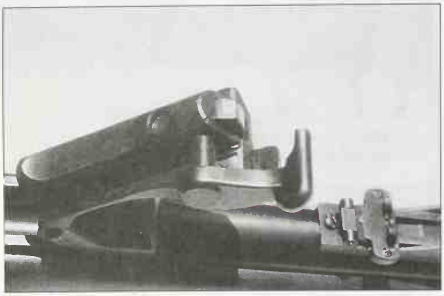


Open the breech block all the way to be certain the chamber is empty.

2) Lock and stock removal. If the weapon is a rifle, remove the ramrod (#31.) Remove the tang screw (#19) and with the hammer still at half-cock, remove the two side (lock plate) screws (#20) from the left side of the stock (#24). The lock (#32) assembly may now be gently pulled out from the right side of the stock. Depress the band springs (#30) and slide the band or bands (#s 25 & 26) off from the front, the barrel and breech assembly (#s 1 & 4) may be lifted up out of the stock.

After you have taken the barreled action out of the wood, the hinge pin lever (center photo) can be grasped and the pin pulled out to the left side, freeing the breech block for removal.

3) Breech and breech bolt disassembly. With the breech bolt still open, remove the hinge pin (#7) and lift the breech bolt out of its hinge with the breech (#4), the extractor (#6), ejector spring (#8) and spindle (#9) may now be lifted out of the hinge. To disassemble the breech bolt, remove the breech block cap screw and remove these parts together: cam latch (#13), thumb piece (#15) and breech block cap (#14), now the breech block cam spring may be lifted out. By unscrewing the firing pin screw (#17) from the bottom side of the breech bolt, the firing pin (#12) may be withdrawn out through the rear.



Here's what the cam lock looks like; this is what locks the action shut.

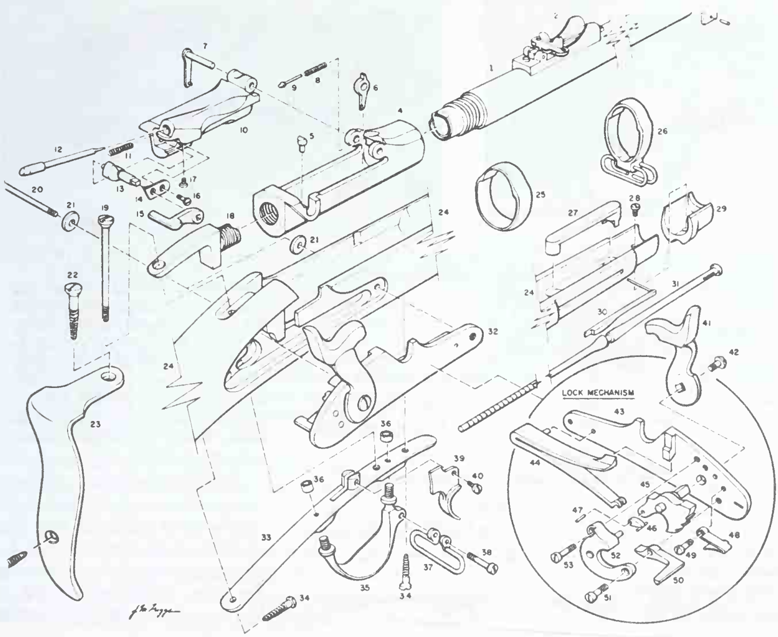
4) Lock and guard plate disassembly. Use a mainspring vise or a small "C" clamp to compress the mainspring (#44) and tilt it out to the side, removing it from the lock plate (#43.) Unscrew the sear spring screw (#49) and lift the sear spring (#48) out. Unscrew the sear screw (#51) and the sear (#50) may be pulled off the lock plate. Remove the bridle screw (#53) and lift out the bridle (#52.) Loosen the stumbler screw (#42) from the center of the hammer and tap the head of the screw until the hammer (#41) loosens, remove the tumbler screw and the hammer may be pulled off. Now lift away the tumbler (#45.) Remove the two guard screws (#34) from the guard plate (#33) and pull the guard plate out of the stock. By unscrewing the two guard bow nuts (#36) the guard bow (#35) may be pulled out of the guard plate. Remove the trigger screw (#40) and the trigger (#39) may be dropped out the bottom of the guard plate.

This late model trapdoor is one the last guns made, it's equipped with a firing pin that is made of hard beryllium copper.

Reverse this procedure for reassembly.

Parts for Trap-door Springfields

1. Barrel
2. Rear sight
3. Front sight and pin
4. Breech
5. Ejector stud
6. Extractor
7. Hinge pin
8. Ejector spring
9. Spindle
10. Breech block
11. Cam latch spring
12. Firing pin
13. Cam latch
14. Breech block cap
15. Thumb piece
16. Breech block cap screw
17. Firing pin screw
18. Breech screw
19. Tang screw
20. Side screws
21. Side screw washers
22. Butt plate screws
23. Buttplate
24. Stock
25. Lower band
26. Upper band
27. Ramrod stop
28. Stock tip
29. Stock tip screw
30. Band springs
31. Ramrod
32. Lock, complete
33. Guard plate
34. Guard screws
35. Guard bow
36. Guard bow nuts
37. Guard bow swivel
38. Guard bow swivel screw
39. Trigger
40. Trigger screw
41. Hammer
42. Tumbler screw
43. Lock plate
44. Mainspring
45. Tumbler
46. Mainspring swivel
47. Mainspring swivel pin
48. Sear spring
49. Sear spring screw
50. Sear
51. Sear screw
52. Bridle
53. Bridle screw



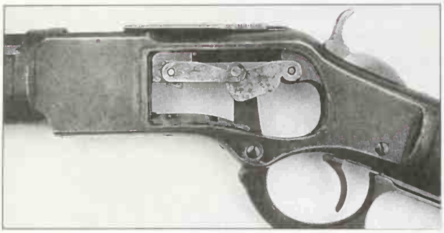
Winchester Rifles

TOGGLE ACTION WINCHESTERS

Henry rifles and Winchester Models 1866, 1873 and 1876 and modern replicas

What are toggle actions, and how do they work?

Several very famous lever action guns that are associated with the opening of the American frontier made use of the toggle-link principle to operate and lock the breech bolt. In the United States it all started with the lever action the of Smith & Wesson magazine pistol in 1854 which fired case-less ammunition. Under new ownership, the S&W designs grew into the .44 rimfire Henry rifle of 1860, which in turn eventually matured into Winchester's models of 1866, 1873 and 1876. The toggle-link principal gained world-wide military attention when was adopted, although in a modified form, by Hiram Maxim who used it with great success in his first machine gun which, with a single pull of the trigger fired at the rate of 600 shots per minute in 1884, and then in semi-automatic pistols by Borchardt and Luger. Recent times and the large demand brought about by cowboy shooting sports have given us modern, Italian made replicas of the Henry rifle and the Winchester Models 1866 and 1873 rifles and carbines in several variations. Manufactured in Italy by Aldo Uberti, these replica lever action weapons are proving to be very popular and have become the mainstay of several competitive cowboy shooting events.



An 1873 Winchester viewed without its side-plates. Here the action is closed and the hammer is down in the fired position. As you can see the toggle link is in more or less a straight line with the breech bolt and the lever's upper arm appears to be pointing straight up. Note the dust (mortise) cover has already been opened, if it were closed the top of the extractor would push it open along with the bolt when the action was operated. Author collection and photo.

Unlike the over-built Maxim machine gun, the toggle-link actions used in our lever action rifles are *minimalist;* their components not occupying any more space in the action than is absolutely necessary for dependable operation, and they have never been considered to be very strong. Not only do they do not have the ability to handle high pressure cartridges, but because of their fixed length feeding and operating systems, most are restricted to using short, pistol-length cartridges (the exception to this being the Model 1876 Winchester.) However, the old lever operated, toggle actions are quite well known for their dependability and when they are in good repair; they surely will operate just about as slick as any greased hog you ever handled. Most of Winchester's production are still operating after more than 100 years, even though many of them have become worn and may be in need of repair, the lion's share of these same classic western guns are still going strong after having seen a century or more of hard use. Alright then, just how did these tough old toggle actions work? These are lever action, repeating firearms; meaning that once the magazine has been charged with cartridges, all of the operations required to load the barrel's chamber and prepare the weapon for firing are accomplished by manually cycling the finger lever once; that is, pushing it all the way down and pulling it all the way back up. To fire repeat shots, it is only necessary to repeat the operation of the lever's cycle before each shot.

Here the 1873's lever is partially opened, you can see how the lever's upper arm has moved rearward and now stands at an angle; the toggle link has begun to knuckle down, drawing the breech bolt slightly to the rear as it does. Notice the hammer is being pushed to the rear by the firing pin, which is moving rearward with the breech bolt and the safety catch is now visible behind the trigger. Author collection and photo.

As the finger lever is lowered, the cam pin at its top-center moves down within the cam slots in each of the rear toggle links, this causes the center of the toggle links, which are hinged, to knuckle downward. This action

Toggle Action

What are they, and how do they work?

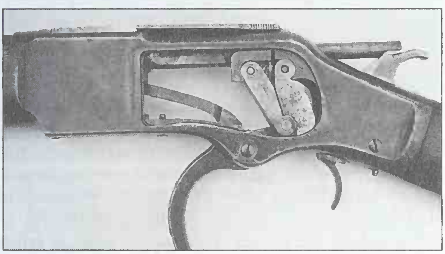
Toggle action repairs for Henry and Winchester Lever Guns and their clones.

Bolt face and rim support repairs.

Dust cover repairs.

Reports of "stretched" brass frames on replica Henry and 1866. rifles.

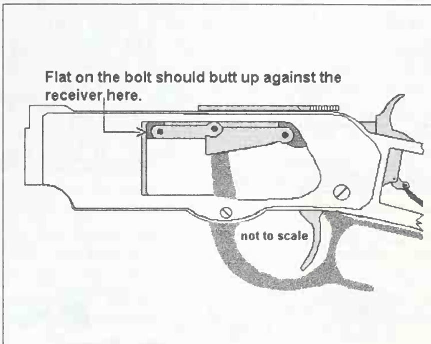
mechanically shortens the links and draws the breech-bolt to the rear. Under the front of the dust cover is a lug which is being engaged by another lug protruding from the top of the extractor, which is mounted at the top front of the bolt, so as the bolt moves rearward; it pulls the dust cover open automatically. As this is happening you will note that the breech-bolt passes over the top of the cartridge carrier which has already had a cartridge from the magazine forced into its tray by the tension of the magazine spring. If the dust cover had been closed before you started to operate the finger lever, the dust cover's lug was contacted by a corresponding lug on the top of the extractor, so that the action of the breech-bolt opening has also automatically opened the dust cover, which will remain open until it is manually closed again. Now as the finger lever is moved farther down and forward; the breech-bolt nears the rear of its travel and a portion of the finger lever comes into contact with the carrier lever, mechanically forcing the cartridge carrier to move upward, so carrying the cartridge in its tray up with it and into line with the barrel's chamber. The finger lever is now reaching its lowest point, near here a small lug contacts the firing pin retractor, causing the firing pin to be forced slightly rearward so that it no longer protrudes through the face of the breech-bolt. During this operation, and all the while you were pulling the finger lever down and the breech-bolt was moving to the rear; the rear end of the firing pin was pushing on the front face of the hammer, causing the hammer to rotate rearward until it reached the cocked position.



In this photo the lever is fully down. The upper lever arm is moved into an angle where it is almost laid straight back, pulling the toggle link all the way into the tucked or knuckled position. The breech bolt is as far back as it can move and the hammer has been cocked by the firing pin's rearward movement. Take note that the carrier lever is now in view, indicating it has been operated by the lever and has in turn pushed the carrier into the loading position. Author collection and photo.

Now as the lever is drawn in the opposite direction (arcing rearward and up) in order to close the action, the toggles have begun to straighten out, or to unbend so that the breech-bolt is being forced forward to the point where it contacts the rear of the cartridge case which is laying in the tray of the carrier. As the lever continues forward it pushes the new cartridge forward with it, finally pushing the cartridge into the barrel's chamber.

As you continue to draw the finger lever back up and it comes into the fully closed position several things will occur; the carrier is pulled back into the down position, the cartridge is pushed fully home into the chamber and the extractor "snaps" over the cartridge rim, the toggle links, by straightening have also pushed the abutting face of the breech-bolt against the abutment of the receiver and finally, as this latter occurs, the links over-cam slightly and the action is felt to "snap shut". The rounded face of the front toggle-link is bearing upon the rear of its machined mortice cut in the breech bolt, just as the rounded face of the rear-toggle link is bearing upon its mortice cut in the receiver. Thus when the cartridge fires, its recoil is transmitted directly to and through the breech bolt, through the over-cammed (locked) toggle links, into the receiver. Finally, squeezing the finger lever hard up into the lower tang raises the safety lever which allows the trigger to be pulled, firing the weapon.

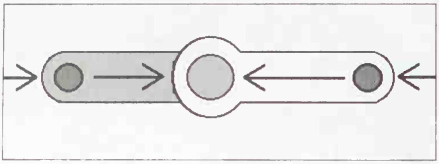


In this last sequential photo, the lever has been returned to the closed position meaning: The toggle links are again in a straight-line, so the breech bolt is locked closed, the carrier lever has fallen lowering the carrier and the hammer is at the cocked position while the position of the lever has pushed the safety catch to the off position. This rifle is ready to fire. Author collection and photo.

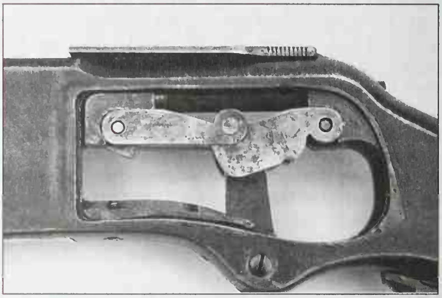
After firing, when the finger lever is drawn down again, the cartridge rim has been grasped by the extractor causing the fired casing to be withdrawn from the chamber and carried along with the breech-bolt to the rear, as the carrier is again raised, its top edges come into sharp contact with the bottom of the fired cartridge casing, causing the old casing to by thrown up and out of the action. Continuing to operate the lever causes the previously described operations to recur.

Toggle action repairs for Henry and Winchester Lever Guns and their clones.

Those years of use, abuse and at times doses of hand loaded ammunition that were probably hotter than acceptable, have left many of these wonderful old lever guns with actions that still function, but that will no longer lock up as tightly as they were intended. Some of the worn areas in these actions are reasonably easy to repair, and these corrections once made, can have a marked and noticeable difference in the operation of these old toggle link actions, so much so that many have trouble believing it is the same rifle. The repaired toggle action rifle may also have an increased safety factor due to the fact that these relatively minor repairs can cause a decrease in the headspace (the distance from the cartridge rim to the face of the breech bolt), which very often has increased to the point where it is larger than tolerable industry safety limits.



As the reader will understand from studying the operation of a toggle action, with this kind of breech action the positioning of the toggles directly effects the headspace, and at least of equal importance, whether the breech-action is actually locked shut or not. As noted above, the way these actions were designed, the rounded areas at the front and rear of the toggles were a close machine fit into and are meant to butt up against corresponding rounded mortice cuts in the breech bolt and frame. Recoil from the cartridge firing is meant to be absorbed in these mortice cuts; directly from the breech bolt, straight through the toggle and into the rear of the frame. After years of wear and abuse however, and since the toggles were made of hardened steel while the frames were left soft, the mortices in the frame will wear, sometimes the frames will even stretch (especially when the gun has been fed a diet of higher pressure than normal smokeless ammunition,) causing the toggles to bear on the axle pins at the breech bolt and frame instead of on the mortices where they should. Once that happens, those pins have by default become the load-bearing axles for the toggles and by this point the head-space has will have begun to increase, sure signs that the toggles are no longer a precision fit in those frame mortice cuts. That can be said for most old toggle action Winchesters with heavy wear or abuse that has brought them into this state of disrepair, and so in these worn guns the positioning of the toggles can be directly related to their fit on their toggle pins, at the front and rear, also, by the toggle drive or finger lever pin located at the top of the finger lever. If any, or all these pins are worn undersized, or if their holes are worn oversized from use gun is probably not completely locked when the lever is all the way up. It is these toggle pins then, their holes and the toggles themselves, that we will take a hard look at first in this repair process.



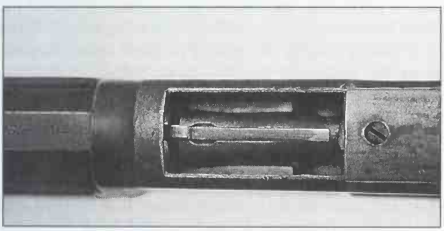
This close-up of the inside of an 1873 action will give you and idea of how the toggle links fit into the receiver mortices. These links don't fit as well as they should, probably an indication that they have been changed over the years. Author collection and photo.

By looking over one of these weapons with the side plates off, you can easily see how loose toggle pins and/or over-sized pin holes can alter the geometry of this toggle action; eventually rendering ineffective its ability to lock the breech. This system itself is rather basic engineering; ingenious but simple. Referring to the illustration, you will see that the front link pin fits through the breech bolt and that the rear pin is *fixed* rather firmly into the gun's receiver. The center axis pin of the toggle-link is actually a rivet that holds the two parts of the link together, forming a hinge which also has machined-in limit stops. Have a close look at those toggles, especially at their hinge area; often you will see them with broken or cracked hinges right around that rivet. A toggle link with a broken or cracked hinge joint should be replaced: if it hasn't completely failed yet, it surely will someday very soon.

There is a hardened steel pin pressed into the top of the finger lever (at least it was a press fit when it was new,) this pin is the *drive-pin* that fits into the cam slots

on the lower, rear/inside of each toggle-link. When the lever is lowered, that drive-pin in the lever moves in an arc to the rear, pulling down on the links, and causes them to knuckle or bend down at the hinge, working very much like the hinge joint in a human knee.

Now those toggle-links are also attached by a pin to a fixed point at the rear of the receiver, so when the links hinge down they collapse on themselves and the breech bolt is forced to rear. On the contrary, when the links are hinged up they expand; the breech bolt is being forced forward toward the barrel, and up against the cartridge's rim. In the ideal, when the finger lever is almost all the way up, and the links are nearing T. D. C. (top-dead-center): the flat area on the forward portion of the breech bolt visible through the sideplate opening, is supposed to butt snugly up against the abutment on the receiver. Picture if you will a hinge that is opened wide; flattened out with both of its ends pushing against its joint at the middle. In this way, as the links are hinged up somewhat forcibly to the T. D. C. location as the lever reaches its fully closed position. You should be able feel this as "over-camming" resistance just before the action closes. This is what makes these actions seem to "snap-shut" as the top of the finger lever loop just touches the bottom of the lower tang.



Looking down into the top of a Winchester 1873 action with mortise cover (right) open and the breech bolt (center) closed. Notice the gap between the front of the bolt and the rear of the barrel, this is where the cartridge rim will fit. Also, note the raised lug on the extractor at the center of the breech bolt, this lug is what pushes on the mortise cover stop to open the mortise cover as the lever is operated. Author photo.

Before this repair job is begun, the sensible first step for the gunsmith would be to measure the rifle's headspace. This job can be made much easier by removing the extractor from the breech-bolt, you should also remove the mainspring for safety's sake, *before* attempting to take this measurement. In these types of guns, headspace may be gauged by measuring the distance between the front of the breech bolt face and the rear of a cartridge rim or headspace gauge. The headspace measurement may be taken by sliding automotive feeler gauges between the front of the breech bolt face and the rear of a cartridge rim, or by using one of the commercially available headspace gauges like the ones sold by Brownell's, Inc.. The measurement of .004-.005" would be ideal but in real life a maximum distance of .008" - .010" is acceptable; but this much headspace clearance is only allowed because these guns use such low pressure cartridges. When you get to the end of this project, once you have refitted the toggles with new, oversize pins to remove any lost motion, and have, if necessary rebuilt and refitted the toggle links, the gun should now have no more than the maximum amount of headspace. If you have a rifle which displays a measurement greater than that after you have finished with your toggle and pin rebuild, at that point you may want to consider taking the barrel off and setting it back one turn, then re-cutting the chamber to correct the excess headspace or as I suggest below, adding material to the bolt face.

The repairs; our purpose and method.

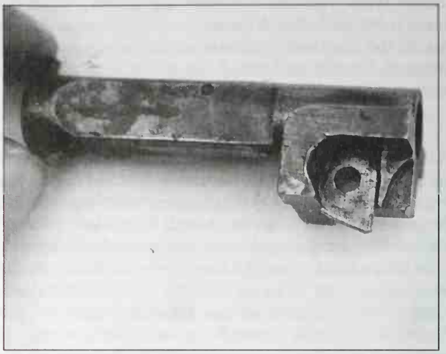
The first portion repair operation is designed to eliminate as much excess play or lost motion in the toggle area as possible in order that we might achieve a tighter and more positive breech-bolt lock-up. During the repair, we will shape the axle pin holes so they are perfectly round once again and then fit them with new, correctly sized axle pins made from high quality drill rod. This portion of the project is one that any well equipped gunsmith can handle, even a skilled amateur with a knowledge of firearms and the ability to perform some light machine work should be able to do a successful job. What we will do first is decide exactly what sizes to ream the pin holes in the toggles, the action frame, the rear of the breech bolt, and the lever top, so that we may fit new, hardened steel pins that should help to remove most, if not all of the excess lost motion in our toggle action. Re-fitting these pins often (but not always) has the effect of restoring the correct fit of the toggle-link ends into their respective mortices in the breech bolt and frame, putting them back where they are supposed to be.

Tools and supplies you will need. You will require a micrometer that measures from 0-1" or an accurate set of dial calipers. Some means to measure the headspace, such as headspace gauges or narrow automotive feeler gauges, some dummy cartridges or brand new empty cartridge cases, some assorted drill rod rounds and a few decimal-size hand reamers that are sized appropriately to the drill rods you will be using, and a T handle to turn the reamers with. A small machine lathe will be very helpful for turning the pins to their final diameter and length, but a patient craftsman might simply chuck the rod in the chuck of a drill press or an electric hand drill mounted in a bench vise to achieve the same end. Fine abrasive paper such as #320 wet-or-dry may be used to polish a few ten-thousandths from the spinning drill rods to achieve more perfect fits. Lastly, you will require a means to harden the finished drill rod pieces into working axle pins. A heat treating oven can be used but lacking this, check with Brownell's and ask them about a product called Tempilac. Tempilac is a brush on substance used for heat treating that visibly melts at

specific, selective temperature ranges, with it you may be able to correctly harden your new pins by using a common propane torch in combination with an electric or gas kitchen baking oven (sorry, but this is not a micro-wave operation.)

We have chosen to use the long-lived and popular Model 1873 Winchester design as our working example, since Winchester made more of these by far than any other lever action model using the toggle action design. The 1873 front and rear toggle pins in this rifle are nominally .155" in diameter. The 1873 finger lever pin is just slightly larger at a nominal .1875" - .1920" diameter. Try to understand that the exact sizes of these pins will vary between different Winchester firearms (the factory used oversized pins in their repairs too,) various Winchester models, and of course, with guns made by other manufacturers such as the modern replicas. As I mentioned above, at one time the Winchester company had factory oversize pins available as service replacements for these lever actions. These oversize pins were made to repair the exact problems we are here for: to eliminate lost motion and to help restore the gun's positive action operation. To repair these front and rear toggle pins you may use pin over-sizes of ten, or even twenty thousandths larger in your efforts to gain a positive fit. As long as it's within reason, it really does not matter too awfully much exactly what size pin is used for the front and rear toggle axles, just so long as you are able to achieve a tight, wobble-free fit at both the toggles and frame; and assuming of course that you have not reamed the holes so large that you have weakened the links in the process. The front and rear pins should be a moderately light drive-fit into the bolt and the soft iron frame, but the toggle holes should be .0005" larger than your new pin so that the toggles will be able to rotate easily on the pins.

Begin by measuring the holes that go through the toggles and their corresponding holes in the breech bolt and the receiver to find the largest diameter. Since the holes will probably have worn to an oval shape, all of these holes would then be hand reamed to that diameter in order to make them round once again. All holes that is *excepting the receiver* hole: the receiver (rear) hole should be reamed .0001" (that is one ten-thousandths) smaller than the holes in the toggles; this is because that specific pin only should be a light to moderate press-fit into the receiver. In order to avoid damaging the receiver during this process, I strongly recommend that this rear pin be pressed into place instead of being driven in with punch and hammer, both during its removal and its installation and the action should be supported correctly as shown in the illustration. If you do not have access to an arbor press then you can make up a support for the frame like the one shown here and use it, supported by an anvil or clamped in a sturdy vise, to protect the frame from damage while this pin is being carefully driven, using a pin punch having a cup-shaped tip.



This view of the left side of an 1873 breech bolt shows how the firing pin retractor looks when in place (lower-center of photo at hole through breech bolt.) Author photo.

For the front toggle-axle pin you will have to remember to also ream the hole that goes through the firing pin retractor along with the breech bolt hole, although the hole through the retractor should be +.0005" to +.001" (that is five, ten-thousandths to one, one-thousandth of an inch) larger than the pin to provide for enough clearance to allow the retractor to operate freely within the bolt. The next step is to choose a diameter of drill rod round that is exactly the size of the new holes (remembering the special note above concerning the rear pin and its light press fit with the frame.) You may want to select a size of rod that is a thousandth larger, and then polish its diameter down to suit that specific, newly reamed hole size. Note that the correct overall length for these pins will be the assembled width of the toggles when installed with all components, *less .005"* (-five thousandths of an inch.) To make the job look more professional, the ends of the pins should be slightly rounded or domed, just like the originals were. If you do make the mistake of leaving these pins too long, you are running the risk of seeing them contact the inside of the side-plates which can cause the action to drag or bind; they may also hold the side plates out preventing them from seating fully with the receiver.

Finger lever pins are a different story, the finger lever's drive or cam pin is made in exactly the same manner as the toggle end-pins were, however this time your oversize maximum diameter should be dictated by the width of the *narrowest point* in cam-slots on the toggles. Using that narrowest measurement, ream the hole in the finger lever to that size for a *light drive pin fit*. Here, you should pay special attention also to the length of this pin, it is *shorter* than the other two pins and should be made to the exact length of the original lever pin you removed earlier. Finish the ends of this pin just like you did with the front and rear toggle pins.

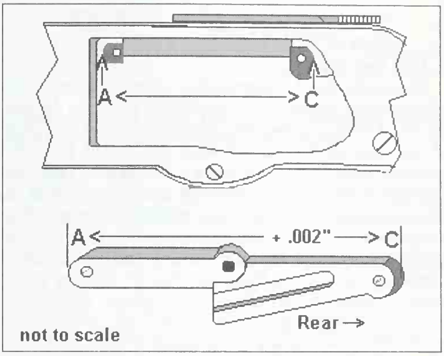
Once your pins are fitted, trimmed to length and you have rounded or domed their heads, they will need to be properly hardened in order to discourage wear and damage. Using the manufacturer's instructions (good quality drill rod, purchased from a known source almost always comes with specific instructions on how to heat treat it, if not, contact the manufacturer) all of your new pins should be hardened and to about 50-52 on the Rockwell C scale and then tempered as per the maker's recommendations.

After you have made, fitted and hardened the new pins, the moment of truth is at hand; it is time to assemble the action. Once assembled, you will normally find that simply by having taken care of those pesky little toggle pin axles, the action's entire operation has become considerably tighter and has a much more positive feel. Depending upon the degree of wear that was present before you started these repairs, that important headspace measurement should also have decreased, thereby increasing the safety of the weapon accordingly. This little "pin repair project" has the potential to pay really big dividends by turning that loose, "rattling" old Winchester into a shooting gun once again. Should the action still show signs of looseness and excess headspace, move on into the next step in our toggle repair process.

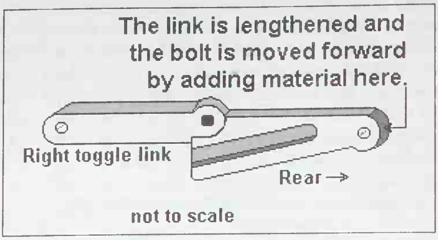
Heavier toggle action repairs:

From the previous illustrations and text you should have the idea that the toggle-links are designed to mate perfectly with their corresponding machined mortice cuts in the rear of the breech bolt and in the receiver, and that it is these surfaces that are meant to absorb the energy from the cartridge being fired and not the pins. We talked also about the idea that we want the front "flat" of that breech bolt to be tightly butted up against the corresponding flat on the inside of the receiver as the action closes, while the rear of the toggle-link is likewise butted tightly up into its own mortice in the rear of the receiver; that's what makes these actions seem to "snap-shut" just as the lever is fully closed. If you have gotten this far, we will have to assume that you have already made the pin repairs we talked about earlier: but that rifle still does not "snap shut" and that the toggle-links do not fit as tightly into their mortice cuts as they should.

Alright then, what we have are worn toggle-mortices in the frame, badly worn links and/or a stretched frame. What we need to correct is the lack of contact between the front flat of the bolt and the flat on the receiver, and this means we somehow need the toggle-links to be longer. In theory you could make the bolt longer by welding or silver soldering material unto the bolt face; doing that would help to correct some excess headspace that might be a problem but that would still will not get rid of lost motion, nor will it make the action snap shut like it should; to achieve those ends we will want to shove the whole breech bolt forward. No way around it, we will either need to replace the toggle links with longer ones, or we will have to make the present links longer. Lengthening those links to shove the bolt forward will decrease headspace at the same time. There are valid reasons on some truly badly worn guns, why you might also want add material to the face of the bolt, but that should be done only after you have the toggle action working properly. We will get into more about that bolt face a bit later.

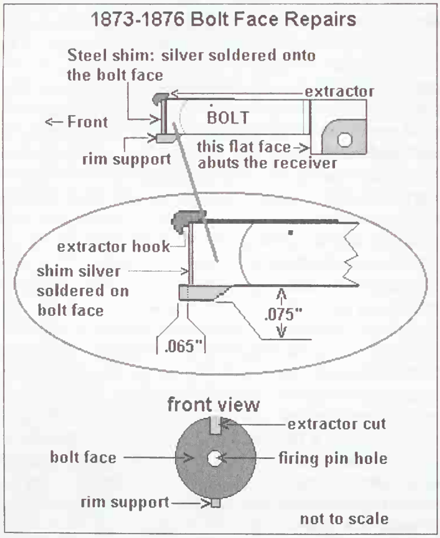


To determine how long your links need to be, shove the breech bolt forward in the receiver until its flat is abutted as shown in the illustration, now measure between points A and C. The measurement, plus .002" is what you will want the final length of your replacement, or stretched links to be. While you have the bolt shoved all the way forward is an excellent time to re-check that headspace measurement, which should have decreased. The headspace measurement you get now will be the same as the one you will get when this toggle-link repair is finished. When new longer toggle-links cannot be found, there are a couple of ways to lengthen the existing toggle-links. When only a few thousandths of an inch more are needed they may be "stretched" by carefully welding new material unto the rear of the rear toggle-links, behind the pin hole. During the welding part of this, I like to wrap the majority of the link assembly in copper sheeting and then lightly clamp the whole thing in a large vise, leaving only about 1/2 "of the link area where the actual welding will be done showing. In this way we are subjecting only a tiny area of the toggle-link assembly to the heat of the welding process. When the weld has cooled, the rear of the links are carefully file shaped and then stone finished to mate with the receiver mortices once again. Should greater distances need to be filled, I like to simply build new, longer front links from a piece of oil hardening steel bar stock. This repair is begun by carefully drilling the head off the center rivet of the links, then driving the rivet out with a pin punch. As shown in the illustration, the steel bar stock is drilled for the hinge rivet hole first and then machined using an end mill to form both sides of the "ear" that will make up the male side of the hinge.

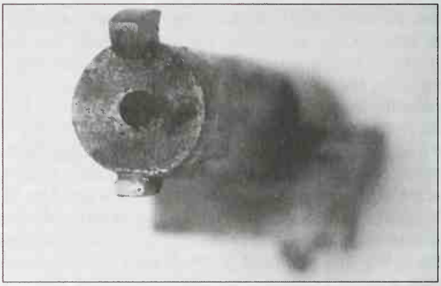


Bolt face repairs:

Headspace may be decreased by silver soldering a steel shim onto the breech face of the bolt as shown in the illustration. Adding a permanent shim like this has the benefit of providing the bolt with a brand new face in place of a pitted old one. Very often when a bolt face is pitted and corroded badly you will also find its firing pin hole has been eroded to such a large diameter that it no longer offers support to the cartridge primer, allowing the primer to flow back into it when a cartridge is fired, yet another benefit of rebuilding the bolt face like this is that you have the opportunity to restore the size of the firing pin hole. To decide on how much material should be added to the bolt face, just use the headspace measurement and do some simple math. The headspace should be right around .006" (six thousandths of an inch,) so if your headspace before the repair was .020"(twenty thousandths of an inch,) then you will want to add .014"(fourteen thousandths of an inch,) to the bolt face. Normally I try to add slightly more material than I need and then finish the bolt face down by filing it to the thickness required. Be sure to use a small machinists square to check on your file work; we want to keep that bolt face at a 90 degree angle to the bolt sides.

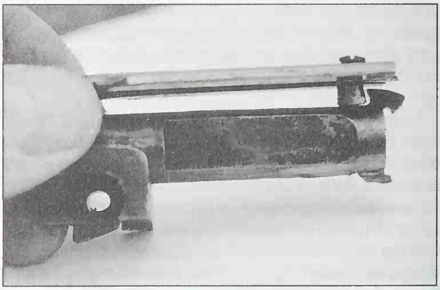


The bolt has an extractor on its top and a fixed, cartridge rim lug on the bottom. During this repair we will have to deal with these because by adding material to the bolt face, thereby moving the face of the bolt forward, may effect the functions of both. Let's assume the final thickness of the bolt means that you have moved its face forward .014" (fourteen thousandths of an inch); this means you will probably have to remove that much, or nearly that much, from the rear face of the extractor's hook, or enough so that a cartridge rim will fit between it and the bolt face.



A face-on view of the 1873 Winchester breech bolt. At the center-top is the extractor, the lug on the bottom-center supports the cartridge rim during extraction. Author photo.

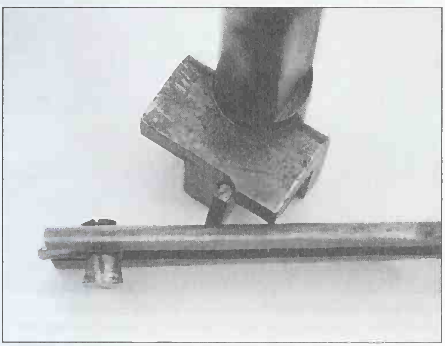
That odd little lug on the bottom of the bolt face is there in order to provide support to the cartridge during extraction, without this lug, or with a lug that is too short, the rim won't be held up from the bottom so the rear of cartridge may well fall downward as the cartridge case clears the chamber, disengaging itself from the extractor hook. If the lug on your bolt has been broken or altered, or if it is now too short after adding material to the bolt face: Try filing off the old lug until you have created a small flat on the bottom of the bolt and silver solder a new lug in place of it as shown in the illustration. The new lug should protrude forward at least .065" but not more than .080".



An 1873 breech bolt and mortise cover viewed from the right side. The "lug" at the top of the bolt face is the extractor and you can see how it engages the mortise cover stop. The small projection at the bottom of the bolt face is what supports the cartridge rim during extraction and ejection. Author photo.

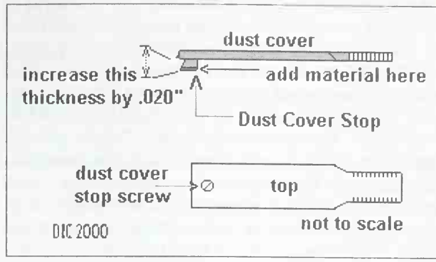
An easy dust cover repair:

The Winchester dust cover is intended to open automatically as the lever action is operated. During lever operation what happens is the dust cover lug gets pushed to the rear by the top portion of the extractor, which is attached to the bolt, so as the bolt moves rearward it drags the dust cover along with it, leaving the dust cover in the open position. Sometimes the dust cover will have become a really loose fit on the receiver from wear and damage, and often when that happens the dust cover won't open when the lever is operated. Because the dust cover has become so loose, its vertical play allows the lug to simply jump over the top of the extractor, so even though the bolt is moving rearward, the cover stays right where it is. Later toggle action Winchesters have their dust cover rails machined directly into the receiver top, but on early model 187's and 1876's the mortice rails were machined into a separate part that was screwed onto the receiver top. Check the tightness of those screws before you assume that the dust cover needs repair.



The 1873 mortise cover with the mortise cover stop installed. If you look closely at the bottom of the mortise cover stop you will notice where a small piece of steel has been silver soldered onto it, adding enough depth so the extractor can once again engage the stop to operate the cover as Winchester intended. Author photo.

There are times when replacing the dust cover lug with a new part will cure this. As a rule though, what is required is a lug with slightly more depth, so that more of it is presented downward for the extractor top to push on. An easy method of gaining depth is to silver solder a small disc of shim stock to its base, usually about .020" thickness is all that will be required to restore the proper operation of the dust cover. You may make the lug deeper by adding a thicker metal disc but at the same time you will need to exercise care that you don't make the lug so deep that it drags on the bolt top; the bottom of the lug should just miss the top of that bolt.



Now. . . about those reports of "stretched" brass frames on replica Henry and 1866 rifles:

By now I think we've all heard reports that some replica Models 1866 and Henry rifles in 44/40 caliber are turning up with excess headspace after being fired to varying degrees. This was first brought to our attention some time ago and since then we have been paying careful attention to these models of guns we have been seeing with excess or "increased" headspace. Before jumping to the conclusion that the frames were stretching, we decided to take a careful look for ourselves. How do you know the frame is stretched? Simply because the frame is not steel, leads many to conclude on supposition alone that this soft metal *must* have expanded. That argument is seemingly made even stronger by the fact that the original rifles used the old black powder .44 rimfire Henry cartridge that operated at very low chamber pressures, while these newer clones use and are fired with modern smokeless 44/40 ammunition. The truth is that unless careful measurements had been taken when the specific problem gun was brand new, and then those figures compared with new measurements taken once a headspace problem developed in that gun, there would be absolutely no scientific evidence to support the idea that the frame had stretched.

Here is a close-up view inside an Uberti manufactured Henry action showing the action closed, ready to fire. The Uberti-Henry receiver is nicely machined from brass while the steel toggle links are modern investment castings. Rifle courtesy Uberti US. Author photo.

After learning of this, I measured an Uberti Henry 44/40 (this was an "almost" new gun, having fired only five shots when the length measurements were taken) that after the owner had fired almost a thousand shots there was a measured increase of about .004" in headspace, taking it from .006" up to the maximum safe limits of .010". The question now was: "where did that extra room come from?" Even though the headspace had increased, the measurement between the inside front and rear of the receiver showed no increase at all, indicating that the frame had probably *not* stretched. After a close examination we found that the culprit was the fit, or I should say lack of fit, of the toggles to their seats or mortises in the frame. Instead of being a close and fully machined "bearing fit" in their mortises like an original Winchester or Henry (see photo), the toggles were loosely fitted and were bearing solely on their axle pins with almost no frame contact other than at the pin holes. Hence, when this gun was fired the rearward forces were being transmitted directly to the toggle axle pins and were not being absorbed by the full width of the mortises in the frame along with the pin as they should have been. (See photo) In effect, the links themselves were actually too short to fill up the frame mortises when the action was closed. Since the links where bearing only on their axle pins, each time the gun was fired the bolt slammed rearward and hammered the link pins, eventually causing the hole at the rear pin to wear to an oval shape in the frame. In all fairness to the *soft* metal of the Henry, links that are fitted poorly like this will also wear the axle hole to an oval shape with an iron framed 1873 model.

So, are any of these replica brass frames actually stretching? Perhaps, but I have not seen the conclusive proof yet. Since this discovery, we have carefully examined a couple of dozen similar guns with headspace problems, as well as two 1873 replicas and we found exactly the same cause in every case. The only real cure for this problem is to have the factory, or a skilled gunsmith correctly fit the gun with new, over - length links. These new links would of course have to be fitted closely into their frame mortises, along with new axle pins and the attendant carefully reaming of the pin holes in both receiver and breech bolt.

Uberti USA advises us that over - length links are available for gunsmith fitting.

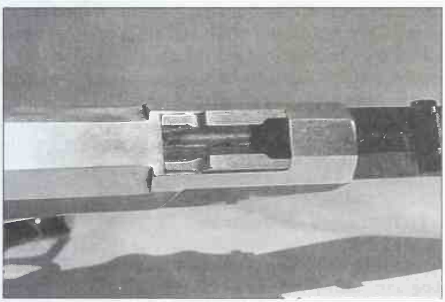
Henry Rifle

Takedown Instructions

Uberti parts nomenclature

These basic instruction steps work for Uberti-made modern replicas, original Henry rifles differ slightly, especially in the firing pin area.

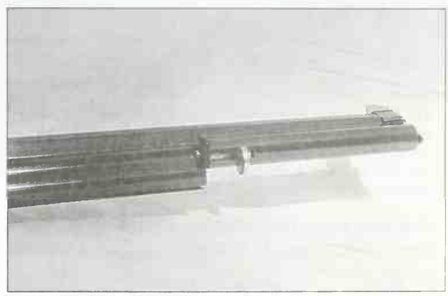
1) Unload! Point the muzzle in a safe direction and holding the rifle around the barrel with your left hand, turn the lever hook [some times called a lever lock] (#542) until it is pointing sideways in order to unlock the lever [Winchester called this a finger lever] (#89). Open the action by pulling the lever (#89) all the way down with your right hand. Check now to be absolutely certain there is no cartridge in the barrel's chamber and that there is not a cartridge laying in the cartridge carrier (#7) within the action. **If there is a cartridge in the carrier then when you close the lever, *the rifle will be loaded.***



This is what you should see when you arte looking down into the opened action of an Uberti replica Henry rifle when you check to be sure the rifle is empty. Note that there is not a cartridge either in the chamber or in the cartridge carrier. Rifle courtesy Uberti USA. Author photo.

To safely unload a Henry rifle with a loaded magazine; always be sure the muzzle stays pointed in a safe direction so that if there were an accidental discharge no one would be injured; then with the *lever still in the open position,* push the magazine follower (#113) all the way forward and hold it there. Now twist the sleeve (#223) as far as it will turn clockwise (when viewed from the muzzle). Hold the rifle over a wooden bench or table top, the rifle may now be tipped so the muzzle is facing down and all cartridges in the magazine should be free to slide forward out of the magazine. Now you may twist the sleeve back to its original position and ease the magazine follower back into place. Check one last time after unloading to be sure that no cartridges remain in the magazine. Keeping you fingers *away from the trigger* altogether operate the lever all the way closed and then back all the way open: There should now be no cartridge in the cartridge carrier (#7.)

2) Butt-stock and mainspring removal: Remove the upper tang screw (#63) from the upper tang, this is the rearmost of the two screws located behind the hammer as well as both the upper and the lower tang wood screws (#62.) The butt-stock (#57) is now loose and may be removed from the action (#1) by pulling it straight off to the rear. Open the lever slightly and remove the mainspring screw (#36) from the lower tang, the mainspring (#20) may now be removed out through the back of the action. Make note of the mainspring's position, during re-assembly the "hooks" at the front of the mainspring have to be manually engaged with the "ears" on the hammer link (#115; Winchester calls this a stirrup.)

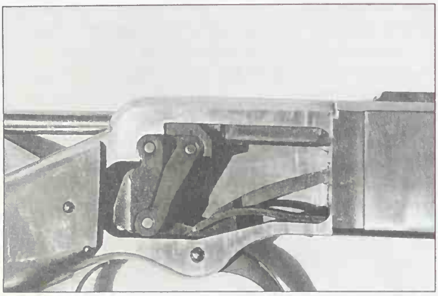


To unload the Henry magazine, push the magazine follower (#113) all the way forward and hold it there. Then twist the sleeve (#223) clockwise (when viewed from the muzzle) as far as it will turn. Hold the rifle over a wooden bench or table top and tip the rifle so the muzzle is facing down to allow any cartridges in the magazine to fall out. Rifle courtesy Uberti USA. Author photo.

3) Sideplate and lever spring removal: Loosen the two lever spring screws (#124) on the bottom of the receiver located just in front of the lever about two full turns each. Remove the lever screw (#101). The sideplates (#s 73-R and 74-L) are dovetailed into the receiver sides and they slide out from bottom to top. Using a small block of hard maple approximately 1/2"X 1/4"X 4" as a drift punch along with a small hammer, carefully drive the side plates up from the bottom, alternating blows between front and rear until both plates are freed from the receiver. Now remove the two lever spring screws (#124) and the Left (#93) and Right (#92) lever springs, noting their positions for later reassembly.

4) Action disassembly: Lift the Left (#84 & 86) and Right (#83 & 85) link assemblies out from their respective sides of the frame. Remove the lever pin (#107) from the top of the lever (#89.)

Lift up slightly on the lifter arm (#90) and pull the lever (#89) straight out through the bottom of the receiver. Push up on the carrier block #7 and withdraw the lifter arm (#90) down and rearwards until it may removed through the lever opening in the receiver bottom. Remove the trigger spring screw (#263) and the trigger spring (#19) from the front of the trigger (#10.) Remove the hammer pin screw (#100) and the hammer (#2) may be withdrawn straight out through its opening in the receiver top. Push down on the carrier block (#7) and remove it through the bottom of its opening in the receiver.



The Uberti-Henry breech block opened all the way. Take note of the tiny pin hole near the rear of the breech block, this is where the firing pin stop pin is located. That pin must be removed in order to disassemble the breech block from the receiver. Rifle courtesy Uberti USA. Author photo.

5) Firing pin, trigger and lever hook disassembly: Using a small pin punch, drive the firing pin stop (#104) out through the side of the breech block (#97), the firing pin extension (#67), firing pin (#98) and firing pin spring may be withdrawn out through the rear of the receiver. While the breech block (#97) may be removed by tilting it all the way down as it is withdrawn toward the rear. Use a pin punch to drift the trigger pin (#99) out from either side of the receiver, the trigger may now be pulled out the bottom. The lever hook (#542) may be removed by unscrewing it out through its hole the lower frame tang. The lever hook spring (#237) is removed by removing the lever hook spring screw (#552) located on the inside of the lower frame tang.

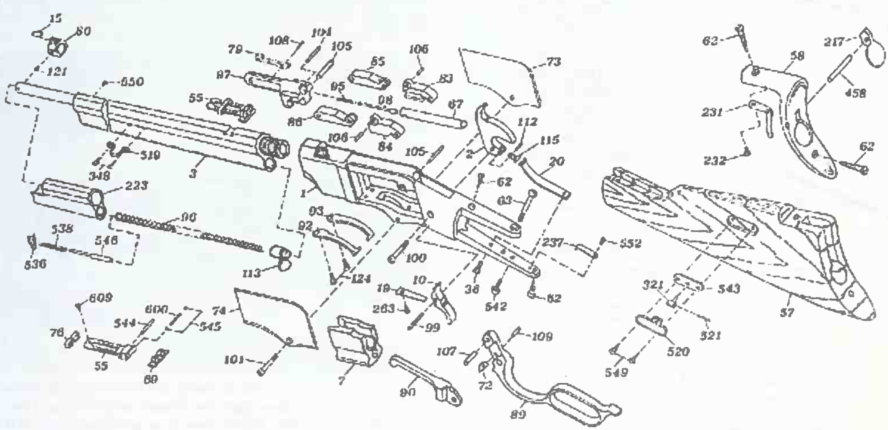
6) Magazine disassembly: Remove the magazine follower screw (#550) from the right barrel side. Push the magazine follower (#113) all the way forward and hold it there while you twist the sleeve (#223) clockwise (viewed from the front) as far as it will turn. The magazine follower #113) may now be carefully eased back out of the sleeve but use caution (and both hands) to control and contain the magazine spring (#96) which is very long and compressed under full tension. Remove the band screw (#121) from the felt side of the barrel's muzzle. The front band (#80) and the sleeve assembly (#223) may be slid forward off the barrel. The sleeve may be further disassembled by unscrewing the sleeve latch rod and removing it and the sleeve latch rod spring (#538) from the inside rear of the magazine portion of the sleeve, the sleeve latch (#536) is now free at the front of the sleeve.

7) Butt-stock disassembly: To remove the butt-plate; remove the two butt-plate screws (#62) one at the top, and one at the rear of the butt-plate (#58). The butt-plate gate spring (#231) may be removed by removing the butt plate gate spring screw (#232.)

Re-assemble the rifle in the reverse order of above.

Uberti-Henry parts

1 Receiver
2 Hammer
3 Barrel
7 Carrier block
15 Sight
19 Trigger spring
20 Main spring
36 Main spring screw
55 Rear
57 Butt-stock
Butt-plate
62 Butt-plate screw
63 Tang screw
67 Firing pin extension
69 Rear base
72 Cam lever
73 Right side plate
74 Left side plate
76 Rear running
79 Extractor
80 Front band
83 Right rear link
84 Left rear link
85 Right front link
86 Left front link
89 Lever
90 Lifter arm
92 Right lever spring
93 Left lever spring
95 Firing pin spring
96 Magazine spring
97 Breech block
98 Firing pin
99 Trigger pin
100 Hammer pin screw
101 Lever screw
104 Firing pin stop
105 Rear link pin
106 Link pin
107 Lever pin
108 Extractor pin
109 Cam lever pin
112 Hammer link pin
113 Magazine follower
115 Hammer link
121 Band screw
124 Lever spring screw
217 Butt plate gate
223 Sleeve
233 Protection running screw
234 Protection running spring
237 Lever hook spring
263 Trigger spring screw
458 Butt plate gate pin
536 Sleeve latch
538 Sleeve latch rod spring
542 Lever hook
544 Rear sight pin
546 Sleeve latch rod
550 Magazine follower screw
552 Lever hook spring screw
600 Rear sight spring
609 Rear running stop screw



Model 1873 and 1876

Takedown Instructions

Uberti parts nomenclature

These basic instruction steps will work for Uberti-made modern replicas and similar firearms, original Winchester rifles will differ slightly (see notes), especially in the firing pin area.

1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, twist the lever lock (#542) located behind the lever loop on the lower tang to allow the lever to be opened, then open the action by pulling the lever (#89) all the way down with your right hand. Check now to be absolutely certain there is no cartridge in the barrel's chamber nor laying in the carrier block (#7) within the action. If there is a cartridge in the carrier then when you close the lever, *the rifle will be loaded.* To safely unload a rifle with a loaded magazine; always be sure the muzzle stays pointed in a safe direction so that if there were an accidental discharge no one would be injured. *Keep your finger away from the trigger* at all times while you operate the lever to the fully open and fully closed positions several times to expel the cartridges in the magazine until no more cartridges are expelled from the action.

2) Butt-stock and mainspring removal: Remove the upper tang screw (#63) from the upper tang; this is the rearmost of the two screws located behind the hammer and then remove the lower tang wood screw (#62.) The butt-stock (#57) is now loose and may be removed from the action (#1) by pulling it straight off to the rear. Open the lever (#89) slightly and loosen the mainspring adjustment screw (#53; the forward-most screw on the lower tang), now remove the mainspring screw (#36; directly behind the mainspring adjustment screw) and the mainspring may be withdrawn out through the rear of the tangs. Make note of the mainspring's position, during re-assembly the "hooks" at the front of the mainspring have to be manually engaged with the "ears" on the hammer link (#115; Winchester calls this a stirrup.)

3) Sideplate and mortise cover removal and disassembly. Unscrew the sideplate screw (#123) and tap the head with a soft plastic screwdriver handle, this will push the rear of the right sideplate (#73) away from the frame so it now may be pulled completely off. Reach back through the opening where the sideplate removed with a 1/4" hardwood dowel and tap the inside rear of the left sideplate (#74) and remove it in the same manner as the right side plate. The ladle (#127; Winchester calls this a spring cover) is located in the right sideplate and may be removed by taking out the ladle screw (#128.) In Winchester terminology, the mortise cover is the sliding plate that keeps dirt out of the top of the action. Uberti-Uberti calls the mortise cover a protection running (#218.) Remove the protection running screw (#233) and slide the protection running all the way back off its rails and off the receiver to the rear. *Be careful:* there is a small coil spring and ball detent (#234 and 284 protection running spring and sphere) under the *protection running!* Lift the protection running guide (#224) out of the receiver top. Winchester-Remove the mortise cover screw and slide the mortise cover all the way back off its rails. Lift the mortise cover stop out of the recess in the receiver top. Remove the mortise cover spring screw and the mortise cover spring will lift off.

4) Links and lower tang removal and disassembly: Lift the Left (#84 & 86) and Right (#83 & 85) link assemblies out from their respective sides of the frame. Remove the two trigger guard screws (#167; Winchester calls these lower tang screws) from either side of the receiver. Tilt the trigger guard (#26; Winchester calls this the lower tang) and pull it out of the receiver from the bottom. Lift up slightly on the lifter arm (#90) and pull the lever (#89) straight out through the bottom of the receiver. Push up on the carrier block (#7) and withdraw the lifter arm (#90) down and rearwards until it may removed through the lever opening in the receiver bottom. Push the carrier block (#7) down and out of the receiver.

Check to be sure the rifle is empty, this is what you should see when you look down into the opened action of an Uberti replica Model 1873. Notice there is no cartridge either in the chamber or in the brass cartridge carrier. Rifle courtesy Uberti USA. Author photo.

5) Breech block and firing pin removal: *Uberti*- Using a small pin punch, drive the firing pin stop (#104) out through the side of the breech block (#97), the firing pin extension (#67), firing pin (#98) and firing pin spring may be withdrawn out through the rear of the receiver. While the breech block (#97) may be removed by tilting it all the way down as it is withdrawn toward the rear. *Winchester*- By using a small pin punch and hammer, drive out the front link pin and pull the firing pin retractor down and out of the breech bolt. Make note of the firing pin retractor's position for later reassembly. The firing pin may now be pulled directly out through the rear of the receiver. The breech bolt may be removed by tilting it all the way down as it is withdrawn toward the rear.

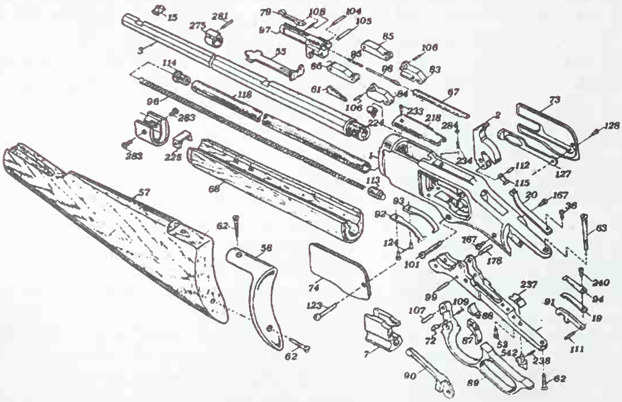
6) Hammer-trigger and tang (trigger guard) disassembly: Push the safety bar (#91) up and pull and hold the trigger (#87) to the rear. Drive out the hammer pin (#178) and lift the hammer (#2) out of its recess in the trigger guard (#26; lower tang). Remove the trigger and lever screw which will free the trigger spring (#19) and the safety spring (#94) to be lifted out of their recess behind the trigger. Drive out the trigger pin (#99) and lift the trigger (#87) and the trigger upper portion (#88; Winchester calls this the sear) out of the trigger guard. The safety bar (#91) may be removed by driving out its pin (#safety spring pin). The lever lock may be disassembled by driving out the lever lock pin (#238), this allows the lever lock (#542) to be pulled out from the bottom and the lever lock spring (#237) to be lifted off the top.

7) Magazine tube and forearm disassembly, rifles: *Uberti*- unscrew the magazine tube plug (#214) from the front of the magazine tube (#118). The magazine spring (#96) and magazine follower (#113) may be removed out through the front of the tube. Remove the two forearm protection (cap) screws (#283), one on each side of the forearm cap and slide the forearm cap forward slightly. Drift out the magazine tube bearing pin (#281) from the magazine tube bearing (#275) and pull the magazine tube (#118) out toward the front, once the tube is clear of the forearm wood, the forearm wood (#68) may be tilted down and pulled forward off the rifle. The magazine tube is then turned toward either side of the rifle 1/4 turn, this frees the magazine tube bearing (#275) from its dovetail cut in the bottom of the barrel (#3.) *Winchester*-Remove the magazine plug screw from the very bottom-front of the magazine tube, the magazine tube cap is now loose and may be pulled out the front of the magazine tube along with the magazine spring and the magazine follower. Remove the two for-end tip (cap) screws, one on each side of the forearm cap and slide the forearm cap forward slightly. Drift out the magazine ring pin from the magazine ring and pull the magazine tube out toward the front, once the tube is clear of the forearm wood, the forearm wood may be tilted down and pulled forward off the rifle. The magazine is then turned toward either side of the rifle 1/4 turn, this frees the magazine ring from its dovetail cut in the bottom of the barrel.

7a) Magazine tube and forearm disassembly, carbines: *Uberti*- Unscrew the magazine tube plug (#214) from the front of the magazine tube (#118). The magazine spring (#96) and magazine follower (#113) may be removed out through the front of the tube. Remove both band screws (#121 and #122) from the front band (#80) and the forearm (#81) band. Remove the magazine tube (#118) by pulling it straight out the front. Slide the forearm band (#121) forward and the forearm (#68) may be pulled forward and off the gun. The front band (#80) may be rotated 180 degrees and slid forward off the barrel, followed by the forearm band (#81.) Winchester-Remove the magazine plug screw from the very bottom-front of the magazine tube, the magazine tube cap is now loose and may be pulled out the front of the magazine tube along with the magazine spring and the magazine follower. Remove the front and rear band screws from the front and rear magazine bands. The magazine tube is pulled straight out the front and off the weapon. Slide the rear magazine band forward off the forearm wood and the forearm wood may be tilted down and pulled off to the front. The forward magazine band is now rotated turn and slid off over the sight base, as is the rear magazine band.

1873 parts

1	Frame
2	Hammer
3	Barrel
7	Carrier block
15	Sight
19	Trigger spring
20	Main spring
26	Triggerguard
36	Mainspring screw
53	Mainspring adj. screw
55	Rear
57	Butt-stock
58	Butt-plate
61	Rear sight
62	Butt-plate screw
63	Tang screw
67	Firing pin extension
68	Forearm
72	Cam lever
73	Right side plate
74	Left side plate
79	Extractor
83	Right rear link
84	Left rear link
85	Right front link
86	Left front link
87	Trigger lower portion
88	Trigger upper portion
89	Lever
90	Lifter arm
91	Safety bar
92	Right lever spring
93	Left lever spring
94	Safety spring
95	Firing pin spring
96	Magazine spring
97	Breech block
98	Firing pin
99	Trigger pin
101	Lever screw
104	Firing pin stop
105	Rear link pin
106	Link pin
107	Lever pin
108	Extractor pin
109	Cam lever pin
111	Safety spring pin
112	Hammer link pin
113	Magazine follower
114	Magazine tube plug
115	Hammer link
118	Magazine tube
123	Side plate screw
124	Lever spring screw
127	Ladle
128	Ladle screw
167	Triggerguard screw
178	Hammer pin
216	Forearm protection
218	Protection running
224	Protection running guide
225	Protection running bearing
233	Protection running screw
234	Protection running spring
237	Lever hook spring
238	Lever hook pin
240	Trigger & lever screw
275	Magazine tube bearing
281	Magazine tube bearing pin
283	Forearm protection screw
284	Protection running sphere
542	Lever hook



The 1885 Winchester Single Shot

Uberti's replica of the 1885 Winchester High-Wall rifle is a lovely example of the gunmaker's art. The color case hardened receiver is forged from 8620 steel. Rifle courtesy of Uberti USA. Author photo.

Winchester's single shot, a brief history. The 1885 Model was the first single shot rifle to be produced by the Winchester company, a firm that up until that time had been world famous for its repeating rifles. Yet another landmark was passed with Winchester's introduction of this rifle, for it marked the company's first use of firearm's genius, John M. Browning's designs, thus beginning a long and fruitful relationship for both parties. The Browning brothers of Ogden, Utah had been making John M.'s 1878 patented single shot rifles on a limited basis for several years before the manufacturing rights were purchased by Winchester in 1883. Browning's single shot was intended to be a much simpler and more efficient falling block action than the Sharps, and in this John Mose Browning succeeded. His design producing not only simplicity, but lightweight, compactness and utter dependability in an action which also offered great strength.

Winchester introduced the Model 1885 in that year and continued its production through an almost innumerable number of factory optional variants through 1920. The rifle's action was made in "High Wall" (large calibers) and "Low Wall" (small calibers) sizes and offered in a vast array of calibers ranging from .22 short rimfire up to a huge .50 caliber center-fire cartridge, as well as a 20 gauge shotgun. In all, slightly more than 100,000 single shot rifles, carbines, muskets and a few shotguns were made by Winchester on this venerable Browning action design. These excellent Winchester 1885 actions, especially the High Wall variant have long been a favorite of single shot rifle builders.

Browning replicas. The modern Browning company made a close replica of the single shot from 1973 though 1983 in several calibers including modern cartridges such as the 22-250 along with the 45-70. Beginning in 1985, the company introduced their new Model 1885 which is still being manufactured in several variations including a black powder cartridge rifle (called the BPCR). 1885s are available in Low Wall or High Wall configurations and come in a variety of modern cartridges as well as some of the classic cartridges of old west such as .45 Colt, 38-55, 40-60 and the workhorse 45-70. The modern Browning-made replicas look good, most of them shoot well and in my experience have proven to be very dependable.

Uberti replicas. The famous Italian arms manufacturer Aldo Uberti also has introduced their own version of the Model 1885 High Wall and Low Wall rifles and I have been fortunate enough to have had several examples in my hands over the last two years. Uberti's rifles are available in quite a few popular calibers from the .22 rimfire up through the 45/120; all the rifles I have shot were by coincidence, all in 45-70 caliber. The rifle is being finished with color case hardened receiver, breech block hammer, trigger, and finger lever that are forged from super tough 8620 steel alloy, with the barrel, sights and buttplate blued. On all of rifles I have handled, the metal shows very careful and professional polishing before the blue and case coloring has been applied, resulting in high quality (no excuses) metal finishing.

When completely disassembled to get a close look at the insides, we see the Uberti firing pin has been altered to be a more modern, small diameter, free floating type. Winchester's firing pin retractor on the link is still there, although the only remaining function is for it to lift the hammer slightly up off the firing pin as the action is opened. The breech block's face has been fitted with a removable firing pin bushing that contains the new firing pin and its spring. The only real objection I have to the Uberti is that it places the hammer at the half cock position, rather than fully cocking the arm. This won't bother hunters, in fact its a nice safety feature but its a waste of time for competition shooters who would appreciate having the self-cocking feature.

Similar to its external appearance, the internal parts of the Uberti replica (other than the alterations noted) look like Winchester could have made them, I know of no better compliment. In another variation from Winchester, Uberti uses the later High Wall coil-type main spring to power the hammer but they have retained the early Model 1885 under-barrel leaf spring as a lever tension spring. An odd combination but it works. A couple of years ago when I test fired my first Uberti High Wall, I fired 14 shots into one 3" group at 100 yards with the factory open sights and the rifle over a sand-bagged rest.

One-Shooters...

Single Shot Model 1885

Takedown Instructions

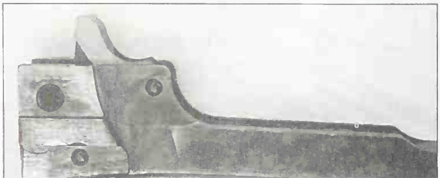
Uberti parts nomenclature

These basic instruction steps will also work for the following similar firearms; Winchester Model 1885 High-Wall and Low-Wall.

Before beginning any disassembly prodedure, always open the action and look into the chamber to be sure the rifle is empty. Rifle courtesy of Uberti USA. Author photo.

1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then open the action by pulling the finger lever (#29) all the way down with your right hand. Look into the barrel and check to be absolutely certain there is no cartridge in the barrel's chamber. If there is a cartridge present; reach in and manually remove it by pulling the cartridge straight out of the rear of the barrel.

2) Remove the butt-stock, forearm and lever spring: Remove the upper (#63) and lower (#62) tang screws and pull the butt-stock (#97) off to the rear. Remove the forearm screw (#183) and remove the forearm (68) by pulling it down first from the front and then towards the muzzle. Remove the lever spring screw (#124) from the underside of the barrel (#3) and the right lever spring (#22). *Winchester notes:* early Winchester Models 1885 made before about 1910 used a leaf mainspring mounted under the barrel in the same fashion as Uberti uses its lever spring.

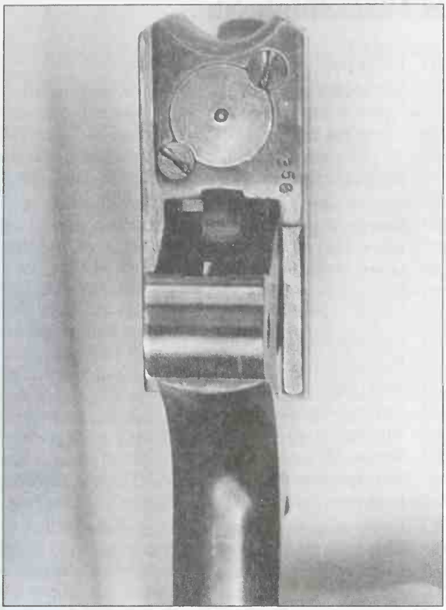


After removing the stock and trigger guard screws, the Uberti single shot's trigger guard (lower tang) can be pulled off to the rear. The part sticking up is called the knockoff. Author photo.

3) Action disassembly: Remove the two trigger guard screws (#167-Winchester called these side tang screws) and pull the trigger guard (#26-this part was known as a lower tang on Winchesters) off the receiver to the rear. Remove the lever screw (#101-Winchester called this a finger lever pin stop screw) and drift out the lever pin (#107-Winchester called this a finger lever pin). Pull down on the finger lever while manually holding the sear (#174) to the rear, to remove the breechblock- hammer- lever assembly out through the bottom of the breech block opening in the receiver (#1.) Note: The extractor (#79) is now loose and will fall out the bottom of the receiver, pay attention to how these parts fit together for reassembly.

This is the finger lever and breech block assembly removed as a unit from the receiver. Author photo.

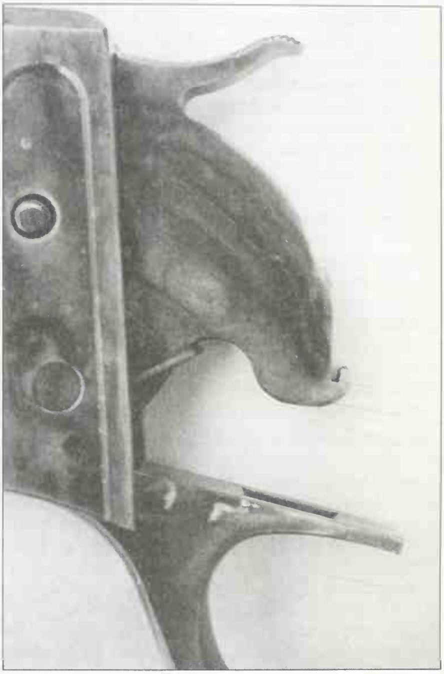
The breech block (#97), hammer (#2), finger lever (#89) assembly can be disassembled by removing the two large axle pins. Uberti has made use of a coiled mainspring which is very similar, although slightly simpler in design than the coiled mainspring used on later (post-1910 manufacture) Winchester single shots.



Uberti uses a hardening steel brushing around the firing pin, this is held into the face of the breech block with two screws.

3a) Further breech bolt disassembly: Remove the two firing pin bearing screws (#661) from the front face of the breech block (#97) and the firing pin bearing (#129) the firing pin spring (#95) and firing pin (#98) may be withdrawn from the front of the breech block. *Winchester notes:* Remove the firing pin retainer screw from the top of the breech block and the firing pin may be removed out through the rear of the breech block.

4) Trigger mechanism: The sear portion of the trigger mechanism is mounted in the upper-rear area of the receiver-frame (#1) itself, while the trigger portion is mounted within the trigger guard (lower tang.) Remove the sear spring screw (#363) and the sear spring (#175) from the underside of the receiver tang. Drift out the sear pin (#199) from either side of the receiver and the sear (#174) may be removed out the bottom; pay careful attention to its positioning. Remove the trigger spring screw (#35) and the trigger spring (#19-Winchester called this the knock-off spring). The trigger (#10) and the knock-off may be removed by driving out their respective pins from either side of the trigger guard, as usual, paying attention to their relationships for later reassembly.

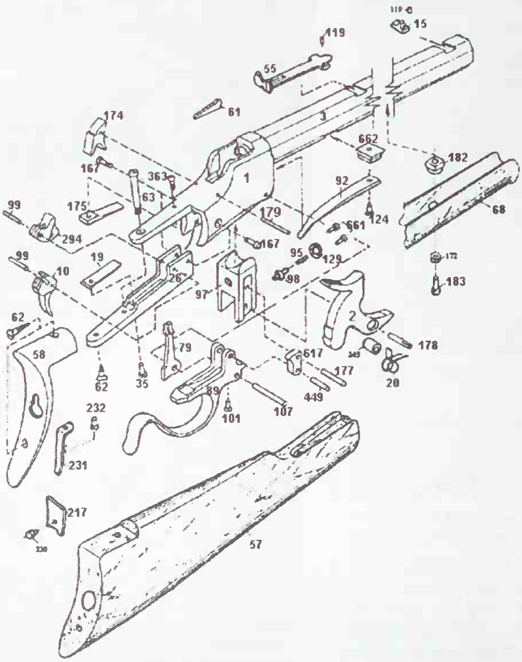


Sear nothces are on the upper-back face of the 1885's hammer, just like the original Winchester. The sear is mounted separately in the receiver. Author photo.

Reassemble the rifle in the reverse order of the above.

Parts list: Uberti Model 1885 Single Shot

1 Frame
2 Hammer
3 Barrel
10 Trigger
15 Sight
19 Trigger spring
20 Mainspring
26 Triggerguard
35 Trigger spring screw
55 Rear assembly
57 Butt-stock
58 Butt plate
61 Rear sight windage
62 Butt plate screw
63 Tang screw
68 Forearm
79 Extractor
89 Lever
92 Right lever spring
95 Firing pin spring
97 Breech block
98 Firing pin
99 Trigger pin
101 Lever screw
107 Lever pin
119 Rear screw
124 Lever spring screw
129 Firing pin bearing
167 Triggerguard screw
172 Forearm cap
174 Sear
175 Sear spring
177 Block pin
178 Hammer pin
199 Sear pin
182 Tenon
183 Forearm screw
217 Butt plate gate assembly
231 Butt plate gate spring
232 Butt plate gate screw
245 Bushing
294 Knock-off
363 Sear spring screw
449 Link pin
617 Link
661 Firing pin bearing screw
662 Lever spring tenon



Winchester Model 1886

Takedown Instructions

Illustration from The Gun Digest Book of Exploded Firearms Drawings, 2nd edition, edited by Harold A. Murtz ©DBI Books Inc., 1977 Printed with permission of the publisher: Krause Publications, 700 E. State Street, Iola, WI 54990-0001 Phone 800 258-0929

1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then open the action by pulling the finger lever (#57) all the way down with your right hand. Check now to be absolutely certain there is no cartridge in the barrel's chamber nor laying in the cartridge carrier (#61) within the action. *If there is a cartridge in the carrier then when you close the lever, the rifle will be loaded.* To safely unload a rifle with a loaded magazine; always be sure the muzzle stays pointed in a safe direction so that if there were an accidental discharge no one would be injured. *Keep your finger away from the trigger* while you operate the lever to the fully open and fully closed positions several times to expel the cartridges in the magazine until no more cartridges are expelled from the action.

2) Butt-stock and mainspring removal: Remove the upper tang screw (#21) from the upper tang, this is the rearmost of the two screws located behind the hammer and the lower tang screw (#22) which is a wood screw. The butt-stock is now loose and may be removed from the receiver (#19) by pulling it straight to the rear. Remove the spring cover screw (#31) from the right side of the receiver and lift the spring cover assembly (#s 29-32) from the receiver. Open the finger lever only far enough to give you access to the mainspring tension screw (#40) which is the rear-most screw on the lower action tang, remove the screw and the rear of the mainspring (#39) may be driven out of its seat with the tang left to right. The ears of the mainspring (#39) are now lifted out of the hammer stirrup (#36) and out of the frame.

3) Hammer and lower tang removal and disassembly: Close the lever and while holding the trigger to the rear, remove the receiver (hammer) screw (#34.) The hammer (#35) may be removed by pulling it upward and to the rear. Open the lever and pull back on the lower tang (#38) which removes by pulling it straight out the rear of the receiver (#19.) The lower tang contains the trigger and its spring. Remove the trigger & sear spring screw (#42) from inside the lower tang and lift out the trigger & sear spring (#41). The trigger (#47) is removed out the bottom of the lower tang by first drifting out the trigger pin (#48) from the side of the lower tang.

4) Action disassembly: Remove the carrier stop screw (#51) and the carrier stop (#50) may now be removed from behind the underside of the upper tang. Drift out (from left to right) the finger lever bushing pin (#54) and remove the finger lever bushing (#56.) This pin appears to be a screw but it is not, it is actually a split pin. Remove the locking bolts (#s 53 Left and 52 Right) by pulling them down out of the receiver. Lower the finger lever and slide the breech bolt (#63) to the rear far enough to expose the lever and breechblock pin (#64.) Drifting out the lever and breechblock pin (#64) will disconnect the finger lever from the breech bolt (#63.) The breech block assembly may be withdrawn out the rear of the receiver. Notice the ejector (#65) is loose now at the front of the breech bolt and may be pulled out the front of the breech bolt along with the ejector spring (#67) and ejector collar (#66), pay careful attention to these parts for later assembly. The lever along with the carrier #(61) and the carrier hook (#62) may be removed by pulling them out through the bottom of the receiver; pay special attention to the relationships of these parts as you separate them. Remove the cartridge stop screw (#74) from the left side of the receiver and lift the cartridge stop (#73) out from inside of the receiver.

5) Lever and breech bolt disassembly: Using a pin punch of appropriate size, drift the friction stud pin (#60) out of the finger lever (#57), this will free the friction stud (#58) and its spring (#59) so they can be pulled out of the hole in the finger lever. The extractor (#69) may be removed from the breech bolt by first drifting out the extractor pin (#70), the extractor can now be removed by pulling it forward and up until it comes free of its seat in the breech bolt. The firing pin (#68) may be removed by pulling it out the rear of the breech bolt.

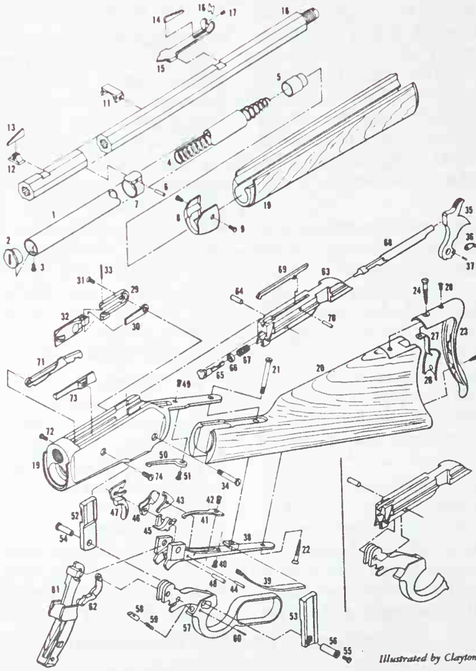
6) Magazine tube and forearm disassembly, rifles: Remove the magazine plug screw (#3) from the very bottom-front of the magazine tube (#1), the magazine tube cap (#2) is now loose and may be turned 1/4 turn with a screwdriver and then pulled out the front of the magazine tube along with the magazine spring (#4) and the magazine follower (#5.) Remove the two for-end tip (cap) screws (#9), one on each side of the forearm cap (#8) and slide the forearm cap forward slightly. Drift out the magazine ring pin (#6) from the magazine ring (#7) and pull the magazine tube (#1) out toward the front, once the tube is clear of the forearm wood, the forearm wood may be tilted down and pulled forward off the rifle. The magazine is then turned toward either side of the rifle 1/4 turn, this will free the magazine ring from its dovetail cut in the bottom of the barrel.

6a) Magazine tube and forearm disassembly, carbines: Remove the magazine plug screw (#3) from the very bottom-front of the magazine tube (#1), the magazine tube cap (#2) is now loose and may be pulled out the front of the magazine tube along with the magazine spring (#4) and the magazine follower (#5.) Remove the front and rear band screws from the front and rear magazine bands. The magazine tube is pulled straight out the front and off the weapon. Slide the rear magazine band forward off the forearm wood and the forearm wood may be tilted down and pulled off to the front. The forward magazine band is now rotated, turned and slid off over the sight base, as is the rear magazine band.

Reverse the above procedures for reassembly.

1886 Winchester parts

1	Magazine tube
2	Magazine plug
3	Magazine plug screw
4	Magazine spring
5	Magazine follower
6	Magazine ring pin
7	Magazine ring
8	Forearm tip
9	Forearm tip screws (2)
10	Forearm
11	Forearm tip tenon
12	Front sight base
13	Front sight
14	Rear sight elevator
15	Rear sight assembly
16	Elevation leaf
17	Elevation leaf screw
18	Barrel
19	Receiver
20	Stock
21	Upper tang screw
22	Lower tang screw
23	Butt-plate
24	Upper butt-plate screw
25	Lower butt-plate screw
26	Buttplate slide
27	Buttplate slide spring
28	Buttplate slide screw
29	Spring cover base
30	Spring cover spring
31	Spring cover screw
32	Spring cover leaf
33	Spring cover leaf pin
34	Receiver screw
35	Hammer
36	Stirrup
37	Stirrup pin
38	Lower tang
39	Mainspring
40	Mainspring tension screw
41	Sear & Trigger spring
42	Sear & Trigger spring screw
43	Sear catch
44	Sear catch pin
45	Sear
46	Kick-off for set trigger
47	Trigger
48	Trigger, sear & KO pin
49	Carrier stop tension screw
50	Carrier stop
51	Carrier stop screw
52	Locking bolt, right
53	Locking bolt, left
54	Finger lever pin
55	Bushing & pin screw
56	Finger lever pin bushing
57	Finger lever
58	Friction stud
59	Friction stud spring
60	Friction stud pin
61	Carrier
62	Carrier hook
63	Breech bolt
64	Lever & breech bolt pin
65	Ejector
66	Ejector collar
67	Ejector spring
68	Firing pin
69	Extractor
70	Extractor pin
71	Cartridge guide
72	Cartridge guide screw
73	Cartridge stop
74	Cartridge stop screw



Illustrated by Clayton Goll.

The 1892 Winchester

Historical overview: Winchester lever guns have always held a great fascination for me, since ever since I was old enough to know any better, and the 1892 continues to be one of my all time favorites. Over the years I have managed to own probably twenty or more Model 1892's in various calibers and configurations, many of them in .44/40. The 1892 is one of those beautiful, original John M. Browning designs that will always be hard to improve on. They were originally built to handle revolver cartridges so that a person could own a sixgun and rifle in the same caliber, and the 1892 was originally made in .44, .38 and .32 Winchester center fire, the same cartridges we have come to know as .44/40, .38/40 and .32/20. Lightweight and very simple, the Model 1892 was intended by Winchester to be the replacement for the classic 1873 model which was both popular and dependable, but also heavy and expensive for the company to manufacture. The well liked Winchester '73, of course evolved from the 1866, the Henry, and Volcanic and is derived from an 1850's design that was never known for the strength of it's action.

Winchester's 1892 answered well for everything that the 1873 model lacked, on top of that it weighed in at about two pounds less than a comparable 1873. The new 1892's were also less expensive to manufacture, and with their Browning designed dual locking lugs, the famous New Haven rifle company now had a truly dependable and brutally rugged little lever action. Winchester fanciers will recognize quickly that the 1892 looks an awful lot like it might be a scaled down Model 1886, that's because it is. On top of that the 1892 was simpler than the 1886; having fewer internal parts, while sharing the same rugged John Browning breech design, plus a firing pin retractor that won't allow the gun to fire until the bolt is locked.

I would imagine that Winchester must have been really pleased with the 1892's sales, over a million were sold in the years from the first in May of 1892 until the last model '65 (a '92 variant) in 1947, they kept design in production for 55 years. A few firearms designs will stand out as being exceptionally well engineered and built and Winchester's 1892 is near the top of that list for me. As a working gunsmith/arms restorer, I have handled hundreds of 1892's and what I have seen is that this is one of those few firearms that just doesn't quit. There will be the occasional broken firing pin, usually caused by excessive dry-firing, or perhaps a broken spring here and there, but by and large these are unusually dependable weapons. I think if I had to be stuck somewhere in the wilderness with only one gun to rely on to keep me alive, it would be an 1892 carbine in .44/40.

1892...

Historical overview
Repairs

Built to replace the Model 1873, the John Browning designed Winchester Model 1892 used a much stronger yet more compact receiver. Author collection and photo.

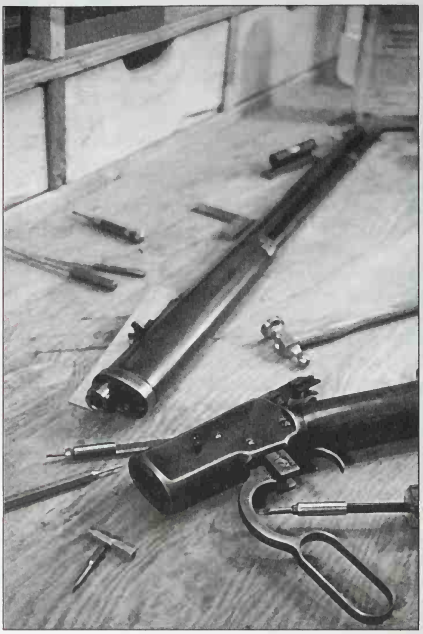
By far the most popular caliber in the 1892 was the .44/40 was with almost 600,000 manufactured. Surprisingly, .25/20 was next with nearly 170,000 produced, .32/20 was third at a pinch under 130,000, and bringing up the rear is .38/40 with around 110,000 units sold. On the order of roughly 640,000 rifles to 360,000 carbines, Winchester's customers preferred the longer barreled rifle over the carbine. 1892 muskets were the scarcest with less than 600 unique weapons made.

The 1892 design has been revived in modern times by Browning, Rossi and Winchester (of course as most of you already know, Winchester and Browning wear the same hat today.) This has always been a popular weapon; it's a light weight, super dependable, handy little gun that packs plenty of punch for its size and the action will handle just about any revolver cartridge safely.

There are many original 1892's around today that were converted in .44 and .357 magnums, .45 Colts and a whole variety of other calibers. About the only 1892 variant I have regularly advised shooters to use caution with is the old Spanish "el Tigre" carbine which was an early copy of the 1892. Most of these I've have examined show excessive headspace and other potentially dangerous problems due to the poor quality of steel used in their manufacture, in addition to some very poor workmanship.

Repairs: As I hinted at strongly just above, there really isn't much that fails on the 1892 Winchester but if I had to try and select some area for you to be careful of it would be the cartridge guide spring. This is a little leaf spring with a hole for a screw on one end that will sometimes turn up broken. The cartridge guide spring keeps the forward (hinged) part of the left hand cartridge guide pushed out into the action and helps to guide the cartridge into the chamber. Browning's action design is so depend-

able that even after this spring breaks normally the rifle will still feed most of the cartridges perfectly. However, if you do find a rare 1892 that is jamming cartridges during the feed process, the cause will most commonly be that this cartridge guide's spring has broken. To change the spring all we need to do is open the action and remove the cartridge guide screw from the left wide of the receiver. With the screw out, the cartridge guide can usually be pried away from the action far enough to remove the old spring with a small dental pick and replace it with a new spring; all this without actually having to take the guide completely out of the rifle.



The "take-down" variant of the 1892 has a quickly removable barrel. After opening the action and unscrewing the magazine tube by using the hinged lever in the magazine cap, the barrel was given a quarter turn counterclockwise and pulled straight out of the receiver. Author photo.

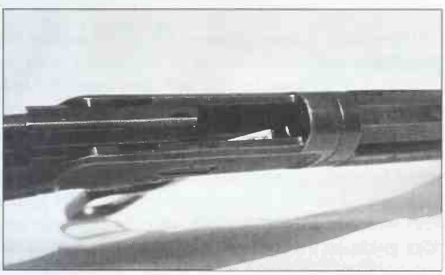
Winchester Model 1892

Takedown Instructions

Numrich Gun Parts Corp. nomenclature

These basic instruction steps will also work for the following similar firearms; Winchester Models 53 and 65, Browning B92, Rossi M92 and Spanish "El Tigre".

1) Unload! Keep your fingers away from the trigger at all times. Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then open the action by pulling the finger lever (#44) all the way down with your right hand. Check now to be absolutely certain there is no cartridge in the barrel's chamber nor laying in the cartridge carrier (#48) within the action. *If there is a cartridge in the carrier then when you close the lever, the rifle will be loaded.* To safely unload a rifle with a loaded magazine; always be sure the muzzle stays pointed in a safe direction so that if there were an accidental discharge no one would be injured. *Keep your finger away from the trigger* while you operate the lever to the fully open and fully closed positions several times to expel the cartridges in the magazine until no more cartridges are expelled from the action.



Looking down into the open action of an 1892 Winchester to make certain there is no cartridge in the chamber or in the cartridge carrier. Notice the seam in the receiver. Author photo.

2) Butt-stock and mainspring removal: Remove the upper tang screw (#25) from the upper tang, this is the rearmost of the two screws located behind the hammer. The butt-stock is now loose and may be removed from the action (#1) by pulling it straight to the rear. Open the lever only far enough to give you access to the mainspring screw (#38) which is the rear-most screw on the lower action tang, loosen and remove the mainspring screw and the mainspring (#37) may be lifted out of its seat with the hammer stirrup (#29) and out of the frame.

3) Hammer and lower tang removal and disassembly: Close the lever and while holding the trigger to the rear, remove the hammer screw (#31.) The hammer (#28) may be removed by pulling it upward and to the rear. Open the lever and pull back on the lower tang (#39) which removes straight out the rear of the action (#1.) The lower tang contains the trigger and its spring. Remove the trigger spring screw (#34) from inside the lower tang and lift out the trigger spring (#33). The trigger (#35) is removed out the bottom of the lower tang by first drifting out the trigger pin (#36) from the side of the lower tang.

4) Action disassembly: Open the lever and remove the locking bolt pin screw (#43) from the left locking bolt, now you may push out the locking bolt pin (#42) from right to left. The locking bolts (#s 40 & 41) may be removed by sliding them out the bottom of the action. Note the positions of the locking bolts for reassembly, there is a right (#40) and a left (#41)side. Close the breech bolt (#26) by hand and slide one of the locking bolts back in place momentarily to hold the bolt in place. Remove the lever pin cover screw (the front screw on the left side of the action.) Exactly opposite this locking bolt pin screw on the right side of the action you will see a small hole, use a pin punch through this hole to drive out the lever & breech bolt pin (#27) from right to left. Remove the lever by pulling it straight out the bottom of the action and remove the temporarily installed locking bolt, the breech bolt (#26) is withdrawn out the rear of the action. Notice the ejector (#F) is loose now at the front of the breech bolt and may be pulled out the front of the breech bolt along with the ejector spring (#G) and ejector collar (#H), pay careful attention to these parts for later assembly.

5) Lever and breech bolt disassembly: Using a pin punch of appropriate size, drift the friction stud stop pin (#47) out of the finger lever, this will free the friction stop stud (#45) and its spring (#46) so they can be pulled out of the hole in the finger lever. The extractor (#B) may be removed from the breech bolt by first drifting out the extractor pin (#C), the extractor may be removed by pulling it forward and up until it comes free of its seat in the breech bolt. Drift out the firing pin stop pin (#E) through the side of the breech bolt and the firing pin (#D) may be removed by pulling it out the rear of the breech bolt.

This is the left side of the 1892 Winchester receiver. The screw at the far left of the receiver is the lever and breech bolt pin hole plug screw (#53) which must be removed before the lever and breech bolt pin can be driven out for bolt removal. Just behind and slightly below this screw is the left side cartridge guide screw (#23), just under and behind #34 is the left side carrier screw (#52) and the last screw on the right is the hammer screw (#31).

6) Further action disassembly: Remove the two carrier screws (#52) one from each side of the action, move the carrier (#48) to the rear and pull it out the bottom of the action. The spring cover (#17) may be removed by removing its screw (#18) which is the rearmost screw on the right side of the action. The spring cover (#17) will now fall loose and may be pulled out of the action. The last two screws are called cartridge guide screws (#23); there is one on each side of the action and they hold the cartridge guides in place. Remove the screws one at a time and then the cartridge guides (#19 and 24). *Note the position* of the cartridge stop spring (#22) which will remove with the left side cartridge guide.

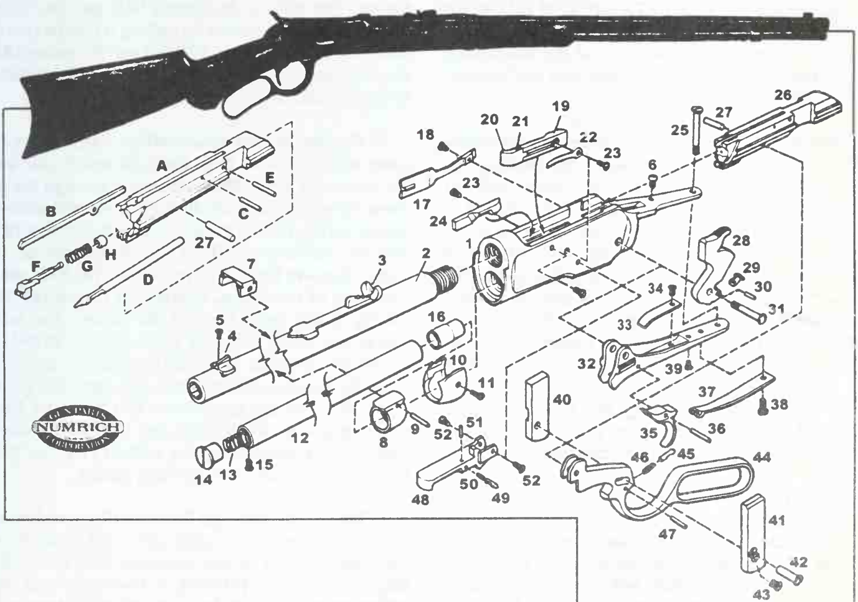
7) Magazine tube and forearm disassembly, rifles: Remove the magazine plug screw (#15) from the very bottom-front of the magazine tube (#12), the magazine tube cap (#14) is now loose and may be pulled out the front of the magazine tube along with the magazine spring (#13) and the magazine follower (#16.) Remove the two for end tip (cap) screws (#11), one on each side of the forearm cap (#10) and slide the forearm cap forward slightly. Drift out the magazine ring pin (#9) from the magazine ring (#8) and pull the magazine tube (#12) out toward the front, once the tube is clear of the forearm wood, the forearm wood may be tilted down and pulled forward off the rifle. The magazine is then turned toward either side of the rifle 1/4 turn, this frees the magazine ring from its dovetail cut in the bottom of the barrel.

7a) Magazine tube and forearm disassembly, carbines: Remove the magazine plug screw (#15) from the very bottom-front of the magazine tube (#12), the magazine tube cap (#14) is now loose and may be pulled out the front of the magazine tube along with the magazine spring (#13) and the magazine follower (#16.) Remove the front and rear band screws from the front and rear magazine bands. The magazine tube is pulled straight out the front and off the weapon. Slide the rear magazine band forward off the forearm wood and the forearm wood may be tilted down and pulled off to the front. The forward magazine band is now rotated, turned and slid off over the sight base, as is the rear magazine band.

8) Special re-assembly notes: When you replace the breech bolt, be sure to assemble the ejector with its spring and collar into the bolt and then install the bolt with one of the locking bolts to hold it in the forwardmost position, this will hold the ejector components in place while you re-install the lever and the lever & breech bolt pin. Remember we mentioned earlier to make note of the position of the cartridge stop spring (#22) which you will reinstall with the left side cartridge guide, so the front of the spring fits in behind the cartridge stop.

1892 Winchester parts

1 Receiver
2 Barrel
3 Rear sight assembly
4 Front sight
5 Front sight screw
6 Upper tang plug screw
7 Forearm tip tenon
8 Magazine ring
9 Magazine ring pin
10 Forearm tip
11 Forearm tip screws (2)
12 Magazine tube
13 Magazine spring
14 Magazine plug
15 Magazine plug screw
16 Magazine follower
17 Spring Cover
18 Spring cover screw
19 Cartridge guide, left
20 Cartridge stop
21 Cartridge stop joint pin
22 Cartridge stop spring
23 Cartridge guide screws (2)
24 Cartridge guide, right
25 Upper tang screw
26 Breech bolt assembly (see lettered parts)
27 Lever and breech bolt pin
28 Hammer
29 Stirrup pin
31 Hammer screw
32 Lower tang
33 Trigger spring
34 Trigger spring screw
35 Trigger
36 Trigger pin
37 Mainspring
38 Mainspring screw
39 Mainspring strain screw
40 Locking bolt, right
41 Locking bolt, left
42 Locking bolt pin
43 Locking bolt pin stop screw
44 Finger lever
45 Friction stud
46 Friction stud spring
47 Friction stud stop pin
48 Carrier
49 Carrier stop
50 Carrier stop spring
51 Carrier stop pin
52 Carrier screws (2)
53 Lever & breech block pin hole plug screw
A. Breech bolt
B. Extractor
C. Extractor pin
D. Firing pin
E. Firing pin stop pin
F. Ejector
G. Ejector spring
H. Ejector collar



Winchester Model 1894

Takedown Instructions pre-1964

Winchester parts nomenclature

1) Unload! Point the muzzle in a safe direction and hold the rifle around the barrel and wooden forearm with your left hand, then open the action by pulling the finger lever (#6294) all the way down with your right hand. Check now to be absolutely certain there is no cartridge in the barrel's chamber nor laying in the cartridge carrier (#1294) within the action. *If there is a cartridge in the carrier then when you close the lever, the rifle will be loaded.* To safely unload a rifle with a loaded magazine; always be sure the muzzle stays pointed in a safe direction so that if there were an accidental discharge no one would be injured. *Keep your finger away from the trigger* while you operate the lever to the fully open and fully closed positions several times to expel the cartridges in the magazine until no more cartridges are expelled from the action.

2) Butt-stock and mainspring removal: Remove the upper tang screw (#16494) from the upper tang, this is the rearmost of the two screws located behind the hammer. The butt-stock (#3394) is now loose and may be removed from the action (#14694) by pulling it straight to the rear. Open the lever only far enough to give you access to the mainspring screw (#5594) which is the rear-most screw on the lower action tang, loosen and remove the mainspring screw and the mainspring (#10694) may be lifted out of its seat with the hammer stirrup (#4294) and out of the frame.

3) Hammer and lower tang removal and disassembly: Close the finger lever and while holding the trigger to the rear; remove the hammer screw (#4594.) The hammer (#4494) may be removed by pulling it upward and to the rear out of the action. Open the finger lever and pull back on the lower tang (#10394) which removes straight out the rear of the action (#14694.) The lower tang contains the trigger and its spring. Remove the trigger stop spring screw (#7494) from inside the lower tang and lift out the trigger stop spring (#7394). The trigger (#7794) is removed out the bottom of the lower tang by first drifting out the trigger pin from the side of the lower tang and then the trigger (#7794) and the sear (#7194) may be lifted out of the lower tang. Note their positions for reassembly.

4) Action disassembly: With the finger lever closed, remove the finger lever pin stop screw (#2994; the front screw on the left side of the action.) Exactly opposite this finger lever pin stop screw on the right side of the action you will see a small hole, use a pin punch through this hole to drive out the finger lever pin (#2894) from right to left. Remove the link pin stop screw (#4894) from the center of the link (#4994) and push out the link pin (#4794) from either side. Pull back and down slightly on the link (#4994) to disengage it from the receiver. You may now remove the finger lever (#6294), link (#4994) and locking bolt (#5094) as an assembly by pulling them straight down out of the receiver, pay attention to how these parts fit together for later assembly. Reach down into the receiver (#14694) from the top and push the carrier (#1294) until its front is hanging out through the bottom of the receiver. The breech bolt (#494) may now be slid out through the rear of the receiver.

5) Lever and link disassembly: The locking bolt is removed from the link by simply pulling it rearward. Remove the finger lever link screw (#3094) and pull the finger lever (#6294; down out through the link #4994). The extractor (#1994) may be removed from the breech bolt (#494) by first drifting out the extractor pin (#2094), the extractor can now be removed by pulling it forward and up until it comes free of its seat in the breech bolt. Drift out the firing pin stop pin (#2094) through the side of the breech bolt and the firing pin (#2594) may be removed by pulling it out the rear of the breech bolt. The ejector (#2194) and its spring (#2394) may be removed from the lower front of the breech bolt by driving out the ejector stop pin (#2494.)

6) Further action disassembly: Remove the spring cover screw (#7094) from the right action side and lift out the spring cover (#6994.) Reach through the spring cover opening with a small screwdriver and remove the carrier spring screw (#1594), the carrier spring (#1494) may be carefully pried up out of its mortise in the frame. Remove the two carrier screws (#1394) one from each side of the action, remove the carrier (#1294) by pulling it out the bottom of the action. The last two screws are called cartridge guide screws (#1894) there is one on each side of the action, they accessible only from the inside and they hold the cartridge guides in place. Remove the screws one at a time and then the cartridge guides (#1964 right and 1794 Left). Note their positions for reassembly. For normal cleaning it is not necessary to remove the cartridge guides.

7) Magazine tube and forearm disassembly, rifles: Remove the magazine plug screw (#11994) from the very bottom-front of the magazine tube (#13394), the magazine tube cap (#11394) is now loose and may be pulled out the front of the magazine tube along with the

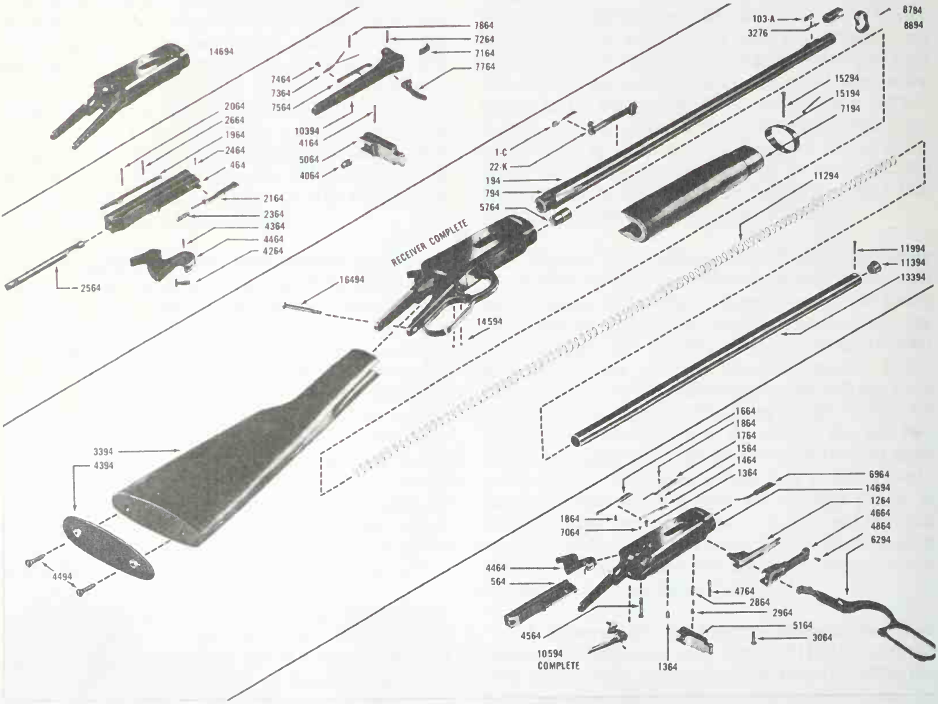
magazine spring (#11294) and the magazine follower (#5794.) Remove the two for end tip (cap) screws (ni), one on each side of the forearm cap (ni) and slide the forearm cap forward slightly. Drift out the magazine ring pin (ni) from the magazine ring (ni) and pull the magazine tube (#13394) out toward the front, once the tube is clear of the forearm wood (#8194), the forearm wood may be tilted down and pulled forward off the rifle. The magazine is then turned toward either side of the rifle 1/4 turn, this frees the magazine ring from its dovetail cut in the bottom of the barrel.

7a) Magazine tube and forearm disassembly, carbines: Remove the magazine plug screw (#11994) from the very bottom-front of the magazine tube (#13394), the magazine tube cap (#11394) is now loose and may be pulled out the front of the magazine tube along with the magazine spring (#11294) and the magazine follower (#5794.) Remove the front (#8794) and rear (#15294) band screws from the front (#18694) and rear (#15194) magazine bands. The magazine tube is pulled straight out the front and off the weapon. Slide the rear magazine band (#15194) forward off the forearm wood and the forearm wood may be tilted down and pulled off to the front. The forward magazine band is now rotated turn and slid off over the sight base, as is the rear magazine band.

Reassemble in the exact reverse order of above.

Winchester 1894 parts

194 Barrel
464 Breech bolt
3394 Butt stock
4394 Butt-plate
4494 Butt-plate screws
1264 Carrier
1364 Carrier screw
1464 Carrier spring
1564 Carrier spring screw
1664 Cartridge guide, right hand
1764 Cartridge guide, left hand
1864 Cartridge guide screw
1964 Extractor
2064 Extractor pin
2164 Ejector
2364 Ejector spring
2464 Ejector stop pin
2564 Firing pin
4064 Firing pin striker
4164 Firing pin striker stop pin
2664 Firing pin stop pin
6294 Finger lever
2864 Finger lever pin
2964 Finger lever pin stop screw
3064 Finger lever link screw
7194 Forearm
8694 Front band, carbine
8794 Front band screw, carbine
3764 Friction stud
3864 Friction stud spring
3964 Friction stud stop pin
4264 Hammer stirrup
4364 Hammer stirrup pin
4464 Hammer
4564 Hammer screw
4664 Link
4764 Link pin
4864 Link pin stop screw
5064 Locking bolt
10394 Lower tang
10694 Mainspring
5564 Mainspring screw
5664 Mainspring strain screw
5764 Magazine follower
11294 Magazine spring
11394 Magazine plug
11994 Magazine plug screw
13393 Magazine tube
14594 Peep sight plug screw
14694 Receiver
15194 Rear band, carbine
15294 Rear band screw, carbine
6964 Spring cover
7064 Spring cover screw
7164 Sear
7264 Sear pin
7364 Sear & Safety catch spring
7464 Sear & Safety
catch spring screw
7564 Safety catch
7664 Safety catch pin
16494 Upper tang screw



CHAPTER 7

Shotguns

For many years the backbone of Winchester's pump-action shotgun production was the famous Model 1897. The Model '97 is shown here in riot shotgun form with its action "open". From the Ed "Buddy" Wade collection. Author photo.

Takedown Instructions

Stevens Model 311 Double Barreled Shotgun
Stevens Arms Co. parts nomenclature

1) Unload! Point the muzzles in a safe direction, check to see if the safety button (#193) is on "safe" by trying to slide it to the rear or "safe" position. Cradle the barrels in your left hand around the forearm (#311A-4), with your right hand grasp the gun around the grip but be sure you never go near the triggers (#s 279L & 279R). Use your right thumb to push the top snap (#272: This is the opening lever located on top of the receiver just behind the barrels) to the right side of the gun and the barrels (#218) will break open. If any shells are present in the chambers, remove them and close the barrels.

2) Remove the barrels. Pull down hard on the front end of the forearm (#46), this will disengage its spring loaded forearm iron spring (#43) from its seat under the barrel, tilt the forearm down and pull if off forward. Push the top snap (#4) to the right side of the gun and open the barrels (#49), when they have tilted down slide them slightly to the rear and they will come off in your hand.

3) Remove the butt-stock. Remove the two butt plate screws (#32) and the butt-plate (#5) from the rear of the butt-stock (#52.) On some older models with long trigger guard tangs, is may be necessary to remove the rear trigger guard screw (#311.) Use a large, long handled screwdriver to reach down into the appropriate hole in the butt-stock and engage the stock bolt (#252) and unscrew it. Pull the butt-stock (#708) to the rear off the receiver (#749). The stock bolt and the stock bolt washer (#253) may be dumped out the rear of the butt-stock.

The Scatterguns

Stevens Model 311 takedown instructions

Winchester

Winchester Model 1887 Lever action.

Winchester Model 1887 Lever action take-down instructions.

Winchester Model 1897 Pump action take-down instructions.

4) Action disassembly. Lay two small containers on the work bench top; one will be for parts taken specifically from the left and the other for parts from the right side since they must be reassembled exactly as they came off. Push the safety button (#193) forward and pull both triggers to allow both hammers (#s 107L & 107R) to fall forward. Remove the trigger guard screws (#s 311 and 660) and the trigger guard (#99.) Using a small screwdriver as a lever, shield the rear of the left side of the receiver and carefully pry out the rear of the left mainspring plunger (#167) using caution as the mainspring (#166) will come with the plunger and is under tension. Repeat this operation on the right side. From here on, make careful notes of the positions of all parts for later reassembly. Unhook the ends of the sear spring (#209) from the left (#205L) and right (#205R) sears. Drift out the sear pin and remove the sears and sear spring. Now drift out the other large pin which holds the hammers (left #107L and right #107R), the cocking lever (#37) and cocking lever spring and lift all these parts out of the receiver.

4a) Action disassembly, peripherals. The trigger pin (#285) may now be drifted out and the triggers (#279L left and #279R right) removed from the bottom, note how the trigger springs (#s 284L & 284R) bear upon the top rear of each trigger for reassembly, these springs are mounted with the safety lever at the rear of the receiver. Drift out the safety lever pin (#195) from the rear of the receiver and the safety lever (#194) as well as the trigger springs (#284L left and 284R right) can be removed. The firing pins may be removed by

removing the two firing pin retaining screws (#82), this allows the firing pins (#77) and their springs (#83) to be withdrawn from the rear. Further disassembly of the receiver is not normally required.

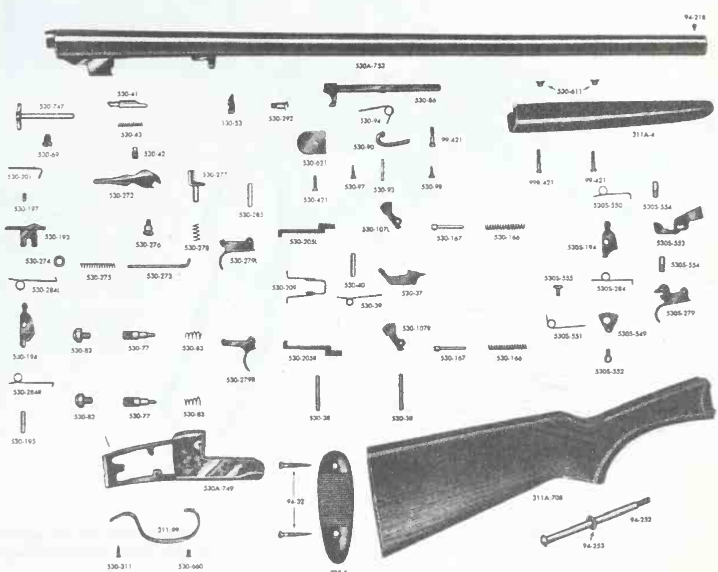
5) Barrel disassembly. The extractor may be removed from the barrel set by unscrewing the extractor screw (#69: the larger of the two screws under the barrel), now the extractor (#747) may be withdrawn out the rear of the barrels. Next remove the cocking plunger retaining screw (#42) the small screw, facing down on the barrel lug) and pull out the cocking plunger (#41) and its spring (#43.)

6) Forearm disassembly. Remove the two forearm screws (#97 and 98) and the forearm iron (#86) may be lifted out of the forearm (#311A-4.) Note the insert (#621) which is loose and will now slide out of the forearm. Remove the ejector screw (#292) and the ejector (#53) may be removed from the front of the forearm iron. The forearm iron spring (#90) can be removed by drifting out the forearm spring pin (#93) and lifting out the forearm spring and the tiny music wire forearm spring, as usual, make note of this spring's position for proper reassembly.

Reverse the above procedures for reassembly.

Parts for Stevens Model 311 Double Barreled Shotgun, double trigger

311A-4	Forearm wood
5	Buttplate
32	Buttplate screw
37	Cocking lever & spring
38	Cocking lever & hammer pin
39	Cocking lever spring
40	Cocking lever spring pin
41	Cocking plunger
42	Cocking plunger retaining screw
43	Cocking plunger spring
53	Ejector
69	Extractor screw
77	Firing Pin
82	Firing Pin retaining screw
83	Firing Pin spring
86	Forearm iron
90	Forearm iron spring
93	Forearm spring pin
94	Forearm spring-spring
97	Forearm screw, long
98	Forearm screw, short
107L	Hammer, left
107R	Hammer, right
166	Mainspring
167	Mainspring plunger
193	Safety button
194	Safety lever
195	Safety lever pin
197	Safety plunger
201	Safety spring
205L	Sear, left
205R	Sear, right
209	Sear spring
218	Front sight
252	Stock bolt
253	Stock bolt washer
272	Top snap
273	Top snap plunger
274	Top snap plunger collar
275	Top snap plunger spring
276	Top snap screw
277	Top snap trip
278	Top snap trip spring
279L	Trigger, left
279R	Trigger, right
284L	Trigger spring, left
284R	Trigger spring, right
285	Trigger pin
292	Ejector screw
311	Trigger guard screw
421	Forearm screw
611	Forearm nut
621	Forearm insert
660	Trigger guard screw, front
708	Buttstock
747	Extractor
749	Frame
753	Barrel



The 1887 Winchester

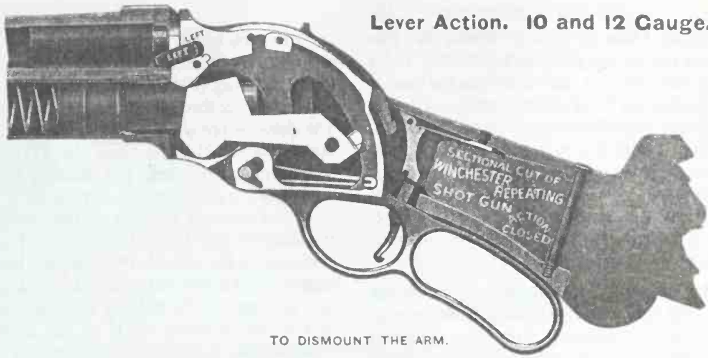
Winchester's Model 1887 lever action shotgun was yet another of John Browning's designs, and was originally purchased from him by Winchester in 1885. The model was manufactured from 1887 through 1901 in both 12 and 10 gauge, when it was superceded by an updated version called the Model 1901 which was offered in 10 gauge only. In recent years the 1887 made an unforgettable appearance as a cut-down version used in the movie Terminator 2. There is a lack of modern replacement parts but the 1887 is a very simple mechanism, using only a few moving parts so it made an extremely rugged weapon which many will find useful in modern cowboy events. The hammer is cocked automatically as the lever closes and despite its simplicity, the trigger is engineered so it can't be held back as the lever is closed, thereby its breech block must be closed and locked before the gun can be fired.

This was an expensive gun to manufacture, as you can well imagine by looking over the machine work that went into that massive one-piece breech block and lever. By the same token the gun was engineered with a strong action and at shotgun pressures there should be little or no worry about an action failure. Pulling the lever all the way up at the same time forces the breech block to slide upward on the breech block pin, up into a machined recess in the receiver so the breech block is effectively locked up against a block of solid steel.

Most 1887 models were manufactured with fluid steel barrels, although a few will be encountered with the more expensive, optional "Damascus barrels," the latter of course should not be fired with any ammunition. All 12 gauge 1887 models were manufactured with 2 5/8" chambers while the 10 gauge versions will have in 2 7/8" chamber length. The later 1887 models (made after about 1889) that have double extractors are your best bet for dependable use in modern shooting events. 12 gauge guns may sometimes have their chambers lengthened successfully to shoot modern "low-brass," 2 3/4" shells, although for more certain dependability we would recommend that you either find a commercial source for the shorter 2 5/8" shells, or learn to load your own. Earlier single extractor guns will work alright some of the time, but those inefficient left-side-only extractors coupled with the rather large diameter of most 19th century shotgun chambers allow the shells to swell, often leaving the gun with at best, sporadic extraction.

THE WINCHESTER REPEATING SHOT GUN,

Lever Action. 10 and 12 Gauge.



TO DISMOUNT THE ARM.

Take out the mainspring. To do this it will be necessary to use a pair of pliers. Compress the mainspring, and draw it backwards through the hammer slot in the breech-block. Remove the right and left carrier screws. Lift the carrier out through the top of the gun. Push out the breech-block pin, and remove breech-block and hammer. To take out the extractor, push the extractor against the lower side of its slot. Push back the extractor spring pin with the point of a knife, and push the extractor hook towards the breech-block stud. The firing-pin is removed by taking out the firing-pin stop screw. To remove the sear, unscrew the sear spring screw. Drive out the sear pin.

WINCHESTER REPEATING SHOT GUN,

Lever Action.

TO KEEP THIS GUN IN GOOD ORDER.

Keep the barrel clean. Wipe out the magazine occasionally. Oil the mainspring seat where its bent end touches the breech-block through the hole in the breech-block.

Occasionally clean the extractor stem and the hole in which it works; also the extractor spring and plunger and the hole in which it is set.

TO ASSEMBLE THE GUN.

Replace the sear spring and sear spring screw partially. Put in the sear and the sear pin. Tighten the sear spring screw. Lay the hammer and breech-block together, and pass them into the receiver from below. Slip in the breech-block pin. To facilitate placing the hammer it will be necessary to hold back the sear. Lay the right and left hand carriers together, and slip them into place from above. Replace right and left carrier screws. This is most readily done when the breech-block is nearly in the closed position. Slip in the mainspring through the hammer slot in the breech-block. Compress it and slip it into place. Be sure that the hooking end of the mainspring lies around the hammer pin, and that the short end of the mainspring lies against the hammer.

These two old illustrations were taken from an 1894 vintage Winchester catalog and offer a good explanation of how the Winchester Model 1887 lever action shotgun works.

Takedown instructions

Winchester Model 1887 Lever Action Shotgun

1) Unload first! Make absolutely certain that this weapon is empty before you proceed any further. Point the muzzle in a safe direction, and then open the breech block (#7) by pulling the lever all the way down; being careful to keep your finger away from the trigger (#26). Look into the barrel's chamber to be sure it is empty and look down into the carriers (#s 30 & 31) which are located just below the open chamber, to be certain there are no more shells still in the magazine. Caution: If there is a shell in the carrier: This weapon will become a loaded gun when you close the lever!

To unload the magazine; keep the muzzle pointed in a safe direction and hold your finger away from the trigger at all times. Operate the lever all the way up and all the way down several times in order to feed any shells that may be in the magazine through the action, until no more shells are ejected when the lever is opened. When you are certain the weapon is empty, return the lever to the closed position, hold back on the hammer (#9) with your thumb and pull the trigger, allowing the hammer to fall forward slowly by easing it all the way down with your thumb.

Note: In order to load the 1887 Winchester it is first necessary to open the lever and breech block all the way, to expose the inside of the action, the shells may then be pushed into the magazine from the rear through the opened action.

2) Action disassembly: First make a dummy or "slave pin" to the dimensions shown in the illustration. Remove the left and right hand carrier screws (#32) from the receiver sides. Drive the breech block pin (#8) out by driving the dummy pin into its place until it is centered. The entire breech block assembly along with both sides (left hand and right hand) carriers (#s 30 & 31) will now remove out through the bottom of the receiver by lowering the lever slightly and pulling the entire assembly down, as you do this; hold the carriers against the sides of the breech block to prevent them from falling off. Once you have the entire assembly out of the receiver, the left and right hand carriers and the cartridge lifter (#33) may now be lifted off the sides of the breech bolt assembly, making careful note as you do of their positions for later reassembly.

3) Breech block disassembly: Use a suitable punch and push out the dummy breech block pin, this will free the mainspring (#10) for removal and the hammer will now come out through the top/rear of the breech block. The dummy breech block pin will be used once again during reassembly. The firing pin (#11) can be accessed by drifting out the firing pin retaining pin (#13), the firing pin (#11) and firing pin spring (#12) will now withdraw out through the rear of the breech block. 1887 Winchesters used two extractor types. One used a single extractor on the left side of the breech block, while later models used a left and right side extractor. The extractors are removed by holding them hard toward the rear of the breech block while at the same time pulling straight out. Use caution: When the extractor(s) is removed the extractor spring and pin which are under great tension will be free to fly out toward the front of the breech block. On single extractor models the breech block stud screw is removed from the right side of the breech block, thus allowing the breech block stud (#16) to be lifted off the breech block.

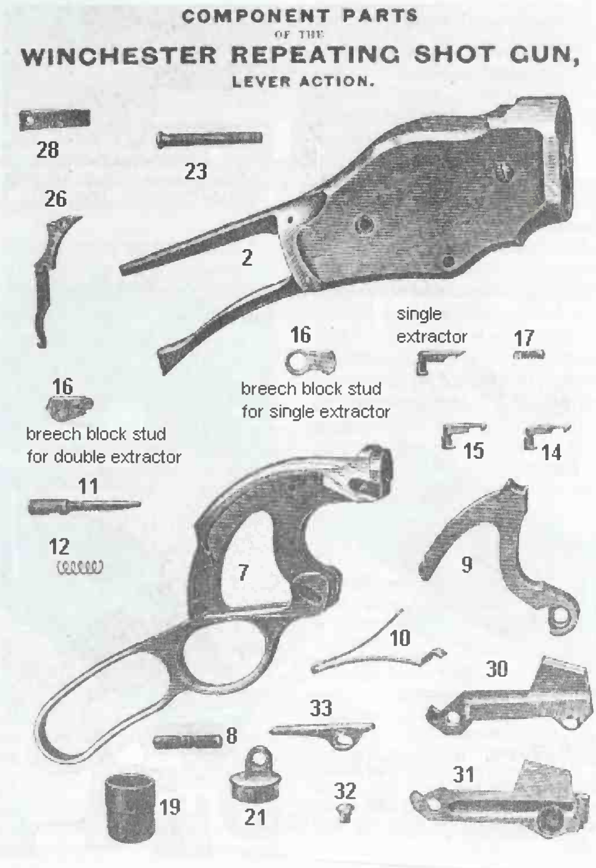
4) Buttstock, forearm and magazine disassembly. Remove the tang screw (#23) and then pull the buttstock (#3) straight back and off the receiver. Remove the forearm wood screw (#6) and the forearm wood panels (#s 4 & 5) may be removed by tilting them out to the side slightly then pulling forward to free them from their seats in the receiver face. Remove the magazine tip screw (#22) and pull down slightly on the magazine tube (#18), making sure to hold tightly onto the magazine tip (#21) which is under spring pressure. The magazine tube assembly may be pulled forward and off the gun, then the magazine tip will come off the front, along with the magazine spring (#20) and the magazine follower (#19).

5) Trigger mechanism: The 1887 trigger is mounted within the receiver and it sears against the rear face of the hammer in a fashion similar to the 1885 Winchester single shot rifle. Remove the trigger spring screw (#29) from the bottom side of the upper receiver tang and the trigger spring (#28) may now be withdrawn. Driving out the trigger pin (#27) from either side of the receiver with a suitable pin punch will enable the trigger (#26) to be removed out through the bottom of the receiver.

Reassemble the shotgun in reverse of the order shown above.

Parts: Winchester Model 1887 Lever Action Shotgun

1. Barrel
2. Receiver
3. Buttstock (not illust)
4. Forearm wood, left (not illust)
5. Forearm wood, right (not illust)
6. Forearm screw
7. Breech block
8. Breech block pin
9. Hammer
10. Mainspring
11. Firing pin
12. Firing pin spring
13. Firing pin retaining pin
14. Extractor, left
15. Extractor right
16. Breech block stud
17. Extractor pin & spring
18. Magazine tube (not illust)
19. Magazine follower
20. Magazine spring (not illust)
21. Magazine tip
22. Magazine tip screw
23. Tang screw
24. Buttplate (not illust)
25. Buttplate screw (not illust)
26. Trigger
27. Trigger pin
28. Trigger spring
29. Trigger spring screw
30. Carrier, left
31. Carrier, right
32. Carrier screw
33. Cartridge lifter

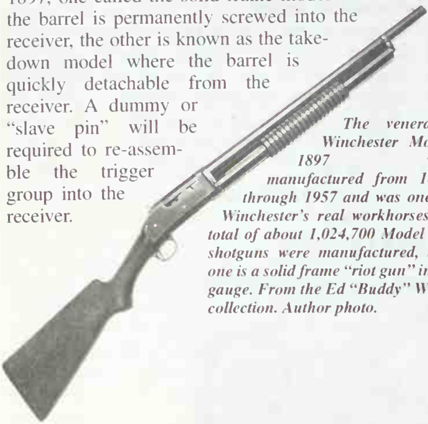


Takedown instructions

Winchester Model 1897 Shotgun

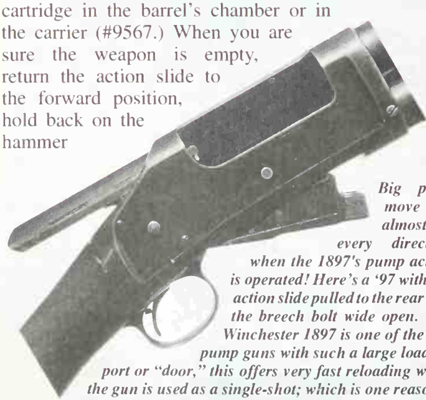
Winchester parts nomenclature

Notes: There are two basic versions of the Model 1897, one called the solid frame model where the barrel is permanently screwed into the receiver, the other is known as the take-down model where the barrel is quickly detachable from the receiver. A dummy or "slave pin" will be required to re-assemble the trigger group into the receiver.

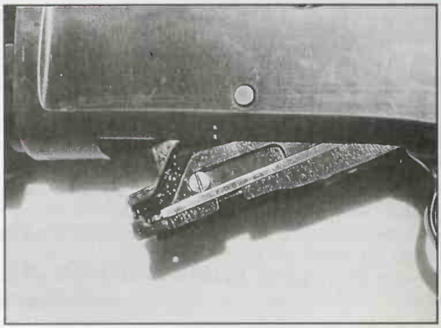


The venerable Winchester Model 1897 was manufactured from 1897 through 1957 and was one of Winchester's real workhorses. A total of about 1,024,700 Model '97 shotguns were manufactured, this one is a solid frame "riot gun" in 12 gauge. From the Ed "Buddy" Wade collection. Author photo.

1) Unload! Make absolutely certain this weapon is empty before proceeding further. Press on the action slide lock release plunger pin (#3297; the button or buttons) which are on one or both sides of the receiver, this will allow any shells in the magazine to be pushed out the bottom of the receiver under spring pressure. Move the action slide handle (# 1597; the wooden forearm) all the way to the rear and look through the loading port in the side of the receiver (#16897) to be sure there is no cartridge in the barrel's chamber or in the carrier (#9567.) When you are sure the weapon is empty, return the action slide to the forward position, hold back on the hammer (#13197) with your thumb and pull the trigger; now ease the hammer all the way down with your thumb.

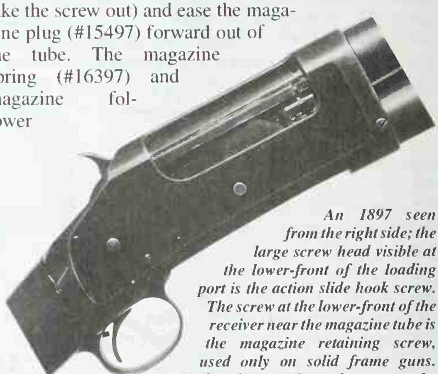


Big parts move in almost every direction when the 1897's pump action is operated! Here's a '97 with the action slide pulled to the rear and the breech bolt wide open. The Winchester 1897 is one of the few pump guns with such a large loading port or "door," this offers very fast reloading when the gun is used as a single-shot; which is one reason it is so popular at cowboy events. From the Ed "Buddy" Wade collection. Author photo.



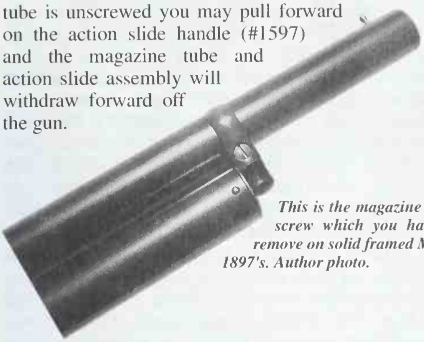
Close-up look at the left side of a '97 with the action opened, you can clearly see the machined cam slot for the action slide in the side of the carrier. The button in the receiver side just above the carrier operates the left side cartridge stop. Author photo.

2) Solid frame guns: (not illustrated) Remove the magazine band screw and slide the magazine band (#14597) forward off the barrel (#4197.) Remove the magazine plug screw (#15597) from the front-side of the magazine tube (#14297) (use caution the magazine spring is pushing forward on the magazine plug, hold the plug in place with your thumb as you take the screw out) and ease the magazine plug (#15497) forward out of the tube. The magazine spring (#16397) and magazine follower



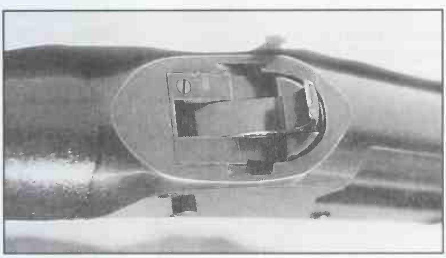
An 1897 seen from the right side; the large screw head visible at the lower-front of the loading port is the action slide hook screw. The screw at the lower-front of the receiver near the magazine tube is the magazine retaining screw, used only on solid frame guns. Notice the prominent button on the side of the receiver below the hammer spur? That's the action slide lock release plunger: If the hammer were cocked you would have to push this button to open the action. Above and to the left of the plunger is the carrier pin. Author photo.

(#16597) may be removed out the front of the tube. Remove the magazine retaining screw (not shown) from the side of the receiver and unscrew the magazine tube in a counter-clockwise direction. Once the tube is unscrewed you may pull forward on the action slide handle (#1597) and the magazine tube and action slide assembly will withdraw forward off the gun.



This is the magazine band screw which you have to remove on solid framed Model 1897's. Author photo.

2a) Takedown guns: Push in on the magazine plug locking pin (#15312) and use the long end which is sticking up to turn the magazine tube (#14797) counter-clockwise about a half turn until it will pull forward. Pull the magazine tube forward as far as it will go, push forward now on the action slide handle (#1597) and rotate the entire barrel assembly one quarter turn counterclockwise, the barrel/magazine tube assembly may be withdrawn forward off the receiver.



Just to the left of the hammer is the carrier pin stop screw which must be removed before the carrier pin can be slid out. Author photo.

3) Action disassembly: Remove the carrier pin stop screw (#10897) from the rear of the gun (this is just behind and to the left of the hammer). With the hammer down, push down on the carrier (#9597), now cock the hammer and using a suitable pin punch, drift out the carrier pin (#10797.) Remove the cartridge guide stop screw (#8197) from the lower right side of the receiver and the entire carrier assembly may be lifted out the bottom of the receiver. You may disengage the breech bolt (#5897) from the action slide hook (#3597) by first removing the action slide hook screw (#3697); located on the lower front of the breech bolt. Pull the breech bolt out through the rear of the receiver and you may then reach into the receiver and retrieve the action slide hook. Note the position of the action slide hook for reassembly later.

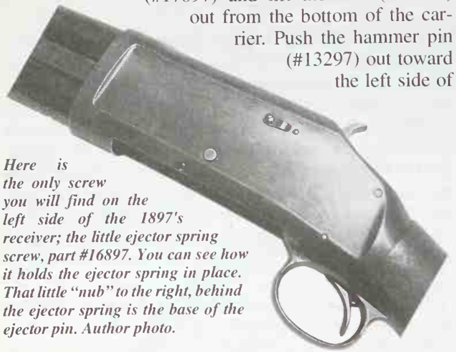
4) Buttstock and trigger group: Remove the two buttplate screws (#9112) and the buttplate (#7397). Use a large-long screwdriver to reach into the center hole in the buttstock (#6297) and remove the buttstock bolt with its washer (#7197), the buttstock may be pulled off the rear of the receiver (#16897.) Drift out the trigger pin (#18297) and the guard bow assembly (#13097) can be pulled straight out the rear of the receiver. The trigger (#18197) is loose and a slave pin will be required for reassembling the guard bow assembly back into the receiver.

5) Subassemblies, barrel, takedown model: Remove the two magazine plug screws (#15597) being careful to hold your finger over the magazine plug (#15497) because it is under tension toward the front from the magazine spring (#16397.) Remove the magazine plug and the magazine plug stop (#15697) from the front of the magazine tube. Make careful note of the position of these parts for re-assembly. Remove the two magazine band bushing screws (#14897) and pry the magazine band (#14597) apart slightly, slide the entire magazine and action slide assembly forward and off the barrel. The magazine band may be slid off toward the front of the magazine tube, be mindful to make note of how the band and its bushing comes off. Further disassembly requires a special spanner wrench to remove the action slide sleeve screw cap (#2597.)

5a) Subassemblies, breech bolt: The firing pin (#12497) may be removed by unscrewing the firing pin lock screw (#12797) and removing the firing pin lock (#12697) and its coil spring (#12897) from the bottom of the breech bolt, then driving the firing pin stop pin (#12997) out of the breech bolt (#5897) from either side, the firing pin may be withdrawn out the rear. The right hand extractor (#11097) is pivoted to the rear and upwards slightly while you force the extractor plunger right hand (#11397) to the rear and hold it there with a dental pick or a tiny screwdriver, the right hand extractor may now be pivoted forward and pulled straight out of the breech bolt: use great care, the extractor plunger is under heavy spring tension, ease it forward and then pull it and its spring (#11497) out of the breech bolt. The left hand extractor (#11197) may be removed by drifting out its pin (#11597) and then lifting the extractor out of its recess.

5b) Subassemblies, carrier: Drift out the mainspring pin (#13797) and loosen the mainspring strain screw (#13697). With the hammer (#13197) all the way forward use a small punch to drive the mainspring so it will slide toward the front of the carrier (#9597) while

disengaging the mainspring from the hammer stirrup (#13397.) Remove the sear spring screw (#18097), and the sear spring (#17997), drift out the sear pin (#17897) and lift the sear (#17797) out from the bottom of the carrier. Push the hammer pin (#13297) out toward the left side of the carrier and lift the hammer (#13197) out through the top. Further disassembly is not normally required.



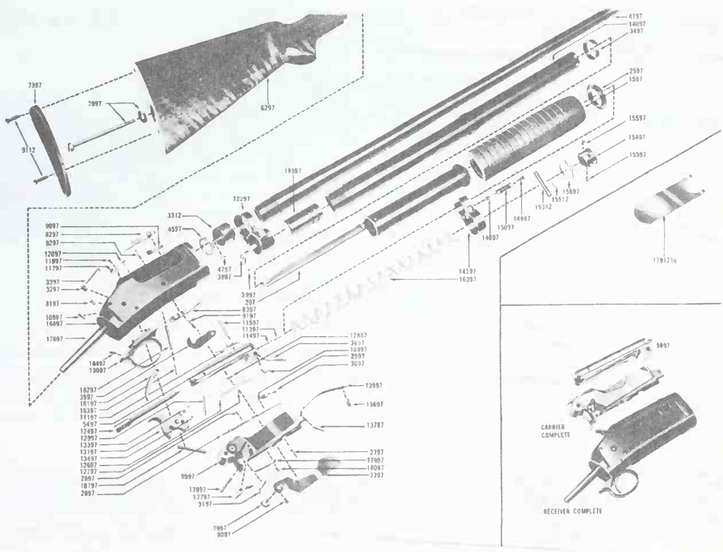
Here is the only screw you will find on the left side of the 1897's receiver; the little ejector spring screw, part #16897. You can see how it holds the ejector spring in place. That little "nub" to the right, behind the ejector spring is the base of the ejector pin. Author photo.

5c) Subassemblies, receiver: From the left side of the receiver (#16897) remove the ejector spring screw (#11997) and lift out the ejector spring (#11797), the ejector pin (#12097) may be pushed in from the outside. Note the position of these parts for reassembly. Looking straight up at the bottom of the receiver, remove the left hand cartridge stop screw (#9297) and lift out the cartridge stop and spring, left hand (#8397): Keep this screw with the cartridge stop and put them in an envelope marked LEFT. Remove the right hand cartridge stop screw (#9197) and lift out the cartridge stop, right hand (#8297), keep this screw together with the right hand cartridge stop. The action slide release plunger pins (#3297) are held in by the action slide release plunger pin springs (#3397), pry up on the portion of the spring farthest away from the pin to remove its tiny bent head from its hole in the receiver, the spring may be pulled out of the pin and the pin pushed out of the receiver.

Reassemble the shotgun is the reverse order of above.

Winchester Model 1897 parts, 12 gauge part numbers

297 Action slide
1597 Action slide handle
2597 Action slide sleeve screw cap
2697 Action slide lock
2797 Action slide lock joint pin
2897 Action slide lock joint pin stop screw
2997 Action slide lock spring
3097 Action slide lock spring screw
3197 Action slide lock release plunger
3297 Action slide lock release plunger pin
3397 Action slide lock release plunger pin spring
3497 Action slide spring
3597 Action slide hook
3697 Action slide hook screw
3797 Action slide complete
3312 Adjusting sleeve, takedown
3897 Adjusting sleeve lock, takedown
3997 Adjusting sleeve lock screw, takedown
4197 Barrel
4597 Barrel chamber ring, takedown
4797 Barrel chamber ring retaining screw, takedown
5497 Breech bolt
5897 Breech bolt, complete
6297 Buttstock
7097 Buttstock bolt & washer
7397 Buttplate
9112 Buttplate screw
7797 Cartridge guide
7997 Cartridge guide friction spring
8097 Cartridge guide rivet
8197 Cartridge guide stop screw
8297 Cartridge stop & spring, right
8397 Cartridge stop & spring, left
9097 Cartridge stop spring
9197 Cartridge stop screw, right
9297 Cartridge stop screw, left
9597 Carrier
10797 Carrier pin
10897 Carrier pin stop screw
10997 Extractor, right
11197 Extractor, left
11397 Extractor plunger, right
11497 Extractor plunger spring, right
11597 Extractor pin, left
11797 Ejector spring
11997 Ejector spring screw
12097 Ejector pin
12297 Extension, takedown
12397 Extension stop screw, takedown
12497 Firing pin
12697 Firing pin lock
12797 Firing pin lock screw
12897 Firing pin lock spring
12997 Firing pin stop pin
13097 Guard bow
13197 Hammer
13297 Hammer pin
13397 Hammer stirrup
13497 Hammer stirrup pin
13597 Mainspring
13697 Mainspring strain screw
13797 Mainspring pin
14097 Magazine tube, takedown
14297 Magazine tube complete, takedown
14597 Magazine band, takedown
14897 Magazine band bushing screw, TD
15097 Magazine band bushing, takedown
15497 Magazine plug, takedown
15597 Magazine plug screw, takedown
15697 Magazine plug stop, takedown
15897 Magazine stop, takedown
15312 Magazine locking pin & spring TD
15512 Magazine locking pin spring
16397 Magazine spring
16597 Magazine follower
16897 Receiver, takedown
17697 Receiver shank
17797 Sear
17897 Sear pin
17997 sear spring
18097 Sear spring screw
18197 Trigger
18297 Trigger pin
18397 Trigger spring
18497 trigger stop screw
17812 1/2 Spanner wrench



THE WINCHESTER REPEATING SHOT GUN, MODEL 1893.

TO DISMOUNT THE ARM.

Open the gun. Drive out the action slide stop pin found in the forward end of the carrier block when the block is down. Unhook the action slide from the carrier by pushing it forward. Press in the firing pin and drop the carrier down. Drive out the carrier pin (which is found just back of the hammer) from the right side. Take out the carrier block. Draw back the breech-block and take out the action hook screw through the hole left in the right side of the receiver for this purpose. Remove the action hook. Withdraw the breech-block.

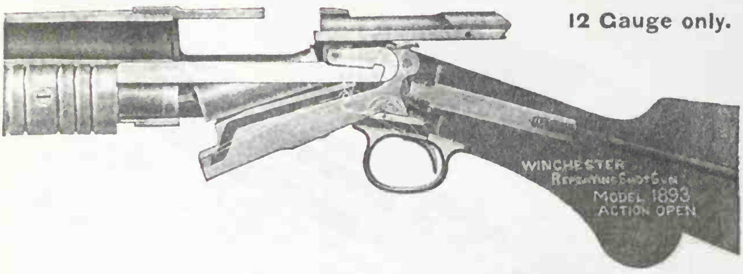
TO DISMOUNT THE PIECES CONNECTED WITH THE CARRIER.

Let down the hammer. Unscrew the sear spring screw. Take off the sear spring. Drive out the sear pin. Drive out the hammer pin and withdraw the hammer. Remove the mainspring strain screw.

TO DISMOUNT THE PARTS ATTACHED TO THE BREECH-BLOCK.

Hold back the extractor spring and pin and lift out the extractor. Remove the extractor spring from the hole which contains it. Drive out the firing pin stop pin. Remove the firing pin stop. Drop out the firing pin.

THE WINCHESTER REPEATING SHOT GUN, MODEL 1893.



TO ASSEMBLE THE GUN.

Put in the breech-block and replace the hook. Put in the action hook screw. A hole is left on the right hand side of the frame through which this screw may be placed. Cock the hammer, push the bolt and firing pin forward and insert the carrier from below. Put in the carrier pin. Let down the hammer. Drive in the slide bar stop pin with the beveled side of head to the rear.

These Winchester 1894 catalog prints show internal details of the Model 1893 which was the immediate predecessor to the 1897. The 1893 did not fare well with the then "new" smokeless powder ammunition so it was quickly redesigned and replaced with the stronger Model 1897.

Glossary of Terms

Action
the word *action* is one of those loosely used terms that could very well mean the firearm's receiver, breech or frame, as well as to referring to the entire operating mechanism of the firearm; including the breech. Just as often it might be intended to mean *only* the weapon's operating mechanism including to the hammer, trigger and their attendant parts as an assembly, or to the specific type of breech operation (revolver, bolt action, lever action, pump action, top-break, etc.), and even to the specific type of firing mechanism; double action, single action, semi-automatic, etc. Of necessity a few of these examples are more closely defined elsewhere in this glossary.

Back action
this term refers to a kind of side-lock action *(see)* which has its mainspring and the majority of the action operating components behind the hammer.

Back-strap
on handguns, especially revolvers; the partially exposed metal portion of the grip frame forming the rear of the grip and acting as the rear support for the grips or stocks.

Back thrust
the forces exerted on the face of the breech or breech bolt by expanding gas pressures inside the cartridge case as the powder charge burns, forcing the bullet forward and the cartridge casing rearward expressed in pounds. As an example; the back thrust in a 30-06 cartridge with a chamber pressure of 50,000 psi may be 8674 pounds.

Balloon head cartridge case
early metallic cartridges were made of folded copper, later of brass and have long been referred to as *balloon* or *folded head* cases. This method of forming the cartridge cases left the rims hollow, and while this left them with a larger internal capacity than our modern, extruded *solid-head cartridge cases (see)*, it also left them weaker; balloon head cases are highly prone to failure in the rim area. It is for this greater internal capacity that many black-powder shooters seek out balloon head cases; for only with the larger powder capacity offered by balloon head cases can they exactly duplicate some of the original black-powder era loads. Balloon or folded head types of casings were in use through the early part of the 20th century in fact, from examining the contents of early 20th century cartridge boxes it appears that the switch to the stronger solid-head cartridge cases was made for high-pressure rifle cartridges some years before it was for low-powered handgun cartridges.

Bar-lock action
this term refers to a kind of side-lock action (*see*) which has its mainspring and the majority of the action operating components in front of the hammer.

Barrel catch
a part which is either lifted up, or pulled to the rear in order to unlock the barrel for loading and unloading with a top-break or tip-up revolver design, or even slid to the rear with the twist barrel Merwin-Hulbert.

Barrel catch cam
a small rectangular part with a slanted cam on one end which acts on the S&W top-break barrel catch through spring tension causing it to automatically close.

Barrel bore diameter
the smallest inside diameter of the rifled hole in the barrel, the bored diameter of the rifled barrel hole, the lands or tops of the rifling.

Barrel groove diameter
the largest diameter of the rifled hole in the barrel, the bottoms or grooves of the rifling.

Barrel throat
that portion at the rear of the barrel, immediately ahead of the chamber, which is generally reamed slightly larger than the remainder of the rifled barrel to accept the bullet or in the case of a revolver barrel, to more gradually accept the entrance of the bullet where it may also be known as a forcing cone *(see)*.

Barrel to cylinder gap
in revolvers, this is a set distance between the front face of the cylinder and the rear face of the barrel which provides clearance for the cylinder to freely rotate. Some gas leakage always occurs from this gap, which must remain to some degree in order to allow the cylinder to rotate. Conversely too large of a barrel to cylinder gap may result in velocity loss, poor accuracy and gas and lead spitting.

Base pin
the axis which the cylinder revolves on. In Colt SA and early DA revolvers this pin is removable, in S&W Top Break revolvers the pin is screwed firmly into the rear of the barrel.

Base pin bushing
on Colt SA and early DA revolvers; a removable bushing that fits into the front of the cylinder which the base pin passes through.

Base pin catch
on Colt single action revolver types and on some early double action revolvers; a spring loaded catch passing through the front of the frame from side to side which is operated to manually release the base pin for cylinder removal.

Blue, *caustic or hot method*
this is a black oxide finish that some believe was developed in Germany between WWI and WWII, and was probably made most well known in this country by Bob Brownell shortly after the latter. Almost all modern factory blueing is accomplished with this economical and efficient method where the prepared steel parts are boiled in a lye-like solution at nearly 300 degrees for several minutes to half an hour to achieve a reasonably durable and good looking black oxide finish.

Blue, charcoal
a old form of heat blueing, the prepared steel parts actually were heated in a "bath" of glowing charcoal and swabbed occasionally with rags soaked with lime or fish oil until and rich blue-black color was achieved.

Blue, fast or express

developed early in the 20th century by custom gunsmiths, and very similar to the slow rust process explained below, the express rusting is accomplished very quickly with the prepared parts at near to boiling temperatures, the rusting parts are then plunged into boiling water. After a few moments the parts are removed for carding *(see below)*, then re-heated, swabbed with acid blueing solution and again plunged into the boiling water. A rich brown-black can be achieved in a matter of minutes by this method that it is very as durable but not as long lasting as with the traditional slow rust blue process.

Blue, rust or slow rust

a most durable and beautiful oxide finish, probably dating from the early 1800's, if not earlier, the prepared steel parts were swabbed with powerful acid solutions, then hung from hooks and allowed to rust in a controlled environment called a "damp box", after a time the rusted parts were plunged into boiling water where the red rust converted into Ferro-ferrosic oxide (black rust), the loose forms of which were "carded" (burnished) off with very mild wire brushes or steel wool, leaving the tough, brown-black oxide. The whole process was repeated several times until a very deep brown-black to plum-black color was gotten.

Blue, nitre or niter

another old form of heat blueing and one of the so-called "temper colors," the prepared steel parts were suspended in molten potassium nitrate (saltpeter) at a temperature range of approximately 450-500 degrees F. until the deep, translucent, so-called *nitre blue* color was achieved, then the parts were removed and instantly quenched in water, brine or in oil. This was sometimes followed by swabbing with sperm oil and baking at 300-400 degrees F. for an hour.

Bolt:

1) the part in a breech loading weapon which locks the breech closed for firing. **2)** the part in a Colt revolver performing the same function as that which S&W calls the cylinder stop. Part of the action, a mechanical device that is used to stop cylinder rotation and to lock the cylinder into battery for firing. **3)** the part in an S&W Hand Ejector, side-swing cylinder revolver which unlocks the cylinder. **4)** a fastener, the term is often used in firearms to denote a fastener that holds the buttstock to the frame or receiver; a stock bolt.

Bolt cam

see Hammer cam.

Box-lock action

in modern terms, a box-lock action is a kind of shotgun action in which the hammers and all internal component parts are enclosed within a compact breech action.

Breech

the rear of the barrel or cylinder where the cartridge(s) would be inserted into the chamber(s). This term is also used loosely to describe the chamber, cylinder, rear of the barrel or breech area of a firearm.

Breechblock

a metal part that is used to close and lock the breech opening in the barrel.

Breech frame

the receiver or frame.

Breech lock

any mechanism that serves to lock the breechblock *(see)* in place.

Breech plug

a threaded plug that is used to close and to seal the rear or breech end of a muzzle loading barrel.

Breech, standing

the forward solid part of the receiver or breech-face which supports the cartridge head during firing, especially in revolvers or top-break action weapons such as break open shotguns.

Bullet, heel

a bullet with two-diameters whose base section is smaller than the cartridge case, allowing that smaller portion to fit inside the case while the nose portion is made the same diameter as the outside of the cartridge case. IE: The .22 rimfire.

Buttstock

on long-arms that use two-piece stocks; that rear portion of the stock which forms the grip, cheek area and rear or butt which contacts the shooter's shoulder. The rear portion of the stock that provides an area with which the rear of the gun is mounted or shouldered by the shooter.

Cartridge, centerfire

a metallic cartridge having its priming at the center of the rim.

Cartridge, rimfire

a metallic cartridge having its priming around the inside of the rim.

CF

an abbreviation for centerfire.

Chamber

that portion of the rifle or shotgun barrel or the revolver cylinder that is machined to specific dimensions which allow it to hold the cartridge and to contain it for firing. In the case of the revolver cylinder, the chamber's functions also include aligning the primer with the firing pin and the chamber mouths with the barrel's bore. The chamber is normally locked closed by a movable breech-block or breech-bolt except in the case of a revolver, where the fixed standing breech of the lock frame performs this function.

Chamber pressure

the force of expanding gas pressure inside the chamber of the firearm when the cartridge or powder charge is fired, also known as breech pressure and expressed as pounds per square inch or psi, and in more recent times as CUP, or copper units of pressure.

Chamber throat

the front portion of the chamber. In revolver cylinders, the front of the cylinder chamber holes.

Cock

This term originally referred to what we would call the *hammer* on a flintlock firearm, it was also the part that secured the flint in its jaw. In modern times the term *cocked*

has come to mean the condition of a weapon when it's hammer or striker is held back under heavy spring tension so that the arm has been placed in the state where it is ready to be fired.

Cocking lever

this term refers to a part(s) used in many "hammerless" double barrel shotguns which serves to cock the hammers automatically as the barrels are tilted down for opening.

Color case hardening

A heat treatment process by which steel or iron parts are impregnated with carbon in order to leave them with a hardened external "skin" while leaving the internal core of the part malleable. Mottled colors in shades of red, blue, yellow and grey are achieved by various methods during the quench process.

CTG

a common 19th century abbreviation for cartridge.

Cylinder

the portion of the revolver which contains the chambers for the cartridges and revolves them into battery for firing.

Cylinder catch

on some S&W top-break revolvers, the cylinder catch is a part located under the barrel's top-strap which retains the cylinder in place against the tension of the extraction process while the breech is being opened for cartridge extraction.

Cylinder end-shake

Cylinder movement, usually unwanted and defined as "play" from front to rear. Lost motion, front to rear in the cylinder as it slides back and forth on its axis.

Cylinder stop

the part in Smith & Wesson revolvers performing the same function as that which Colt calls the bolt. Part of the action, a mechanical devise that is used to stop cylinder rotation and to lock the cylinder into battery for firing.

Cylinder stop, hammer actuated

a cylinder stop or bolt which is operated directly by a portion of the hammer known as the *hammer cam* (see), *bolt cam* or *cylinder stop cam* acting upon it during hammer movement. Examples of this are used in Colt single action revolvers (where it is known as a bolt) and in the Smith & Wesson .44 American single action revolver.

Cylinder stop, trigger actuated

a cylinder stop or bolt which is operated directly by some portion of the trigger acting upon it during the trigger's movement. Examples of this are the Smith & Wesson late model American and all subsequent S&W Model Number Three single actions.

Cylinder stop cam

see Hammer cam.

Double action

any firearm which may be fired by first cocking the hammer and pulling the trigger, as well as by simply pulling the trigger which will cock and release the hammer by its own action.

Draw filing

a method of removing metal from gun barrels, especially heavily pitted barrels in which the file is held at an angle nearly perpendicular to the barrel and pulled or drawn down the barrel's length, also known as *striking (see).*

Dummy cartridge

a normal looking cartridge that is totally inert and incapable of being fired, sometimes having no primer pocket, special coloring or several holes drilled through the casing as a means of identification. Dummies are used by gunsmiths to test various types of action functions, they are the only sort of ammunition that should ever be allowed on your workbench.

Ejection

the act, which may be accomplished either manually or automatically; of physically expelling the spent cartridge case from a firearm occurring after it has been extracted from the weapon's chamber, not to be confused with the process of *extraction (see).*

Ejector

the part that either throws or causes to be thrown, the empty fired cartridge casing from the firearm, as opposed to the *extractor (see).*

Ejector rod

a separate rod that is used to manually extract and eject each cartridge casing from some types of revolver chambers. IE: The Colt Single Action Army

Ejector rod head

a small projecting part that is mounted on the forward end of the ejector rod which enables the user to manually operate the ejector.

Ejector tube

a part, mounted on the barrel side on single action and on some double action Colt type revolvers which contains and guides the manually operated ejector rod and its spring.

Extraction

the act of withdrawing, or removing the fired cartridge casing either partially or completely from the firearm's chamber, after which it might be ejected either manually or automatically from the firearm. Extraction is sometimes confused with the process of *ejection (see).*

Extractor

a moveable part which pushes or pulls on the rim area of a fired cartridge or cartridges in order to withdraw it or them from the chamber or chambers, not to be confused with function of the *ejector (see)*, although in some instances the same part may be used to perform both functions. On Smith & Wesson, later Colt and some other revolvers, the extractor is located at the center-rear of the cylinder and plays the dual role of extracting *and* ejecting all the cartridge cases at once. With many repeating rifles and shotguns the extractor is located somewhere on the front of the bolt so as the bolt is moved towards the rear, the extractor's hook grasps some portion of the cartridge case rim, thereby pulling the case with it, removing the spent cartridge from the gun's chamber. Double shotguns normally use an extractor that is mounted between the barrel's chambers and in some cases may have a more complicated ejector mechanism attached to it in order to automatically expel the fired casings.

Extractor cam
a part mounted inside the barrel/frame hinge joint of many top break revolvers that is used to activate the automatic extraction system as the barrel is opened and pivoted down.

Extractor gear
the *driving* part of the *rack and gear* automatic extraction system mounted in the center of the barrel/frame hinge joint and used in S&W American and Russian top-break revolvers.

Extractor pawl
a part used in the automatic extraction systems of S&W American, Russian, Schofield and some New Model Number 3 top-break revolvers, mounted on or in the frame joint and used to actuate the extraction system as the barrel was pivoted down.

Extractor rack
the *driven* part of the *rack and gear* automatic extraction systems used in S&W American and Russian top-break revolvers located on the front end of the extractor.

Extractor rod
a rod attached to the extractor that is pushed by the extractor cam in order to operate the automatic extractor systems in some top-break revolvers. A type of rod attached to the extractor on modern double action revolvers which is depressed by hand after the cylinder has been swung open to extract the fired cartridge cases from the cylinder chambers.

Extractor stud
an adjustable part that is screwed into the center rear of the extractors in most S&W top-break revolvers that provides a rear axle for the cylinder as well as a means of minor cylinder end-shake adjustment.

Falling block
a kind of action used mostly in single shot rifles that makes use of a breech block traveling vertically in a receiver mortice and supported against chamber pressures by shoulders or abutments in the receiver. Some well known examples of weapons using the falling block action include the Sharps and the Winchester Model 1885.

Fanning
the method of rapidly firing a single action Colt type revolver where the trigger is held to the rear and the gun fired by rapidly wiping the heel of the non-shooting hand repeatedly over the hammer. Fanning can be extremely damaging to the cylinder's stop notches, to the bolt and to the bolt's *window* in the receiver. The fanning process will only work on revolvers which have hammer actuated cylinder stops or bolts and not on the trigger actuated types like the later single action Model Number 3 S&W revolvers.

Feed mechanism
sometimes confused as one of the gun-world's own definitions of "action," the feed mechanism would be all of those parts that cause a weapon to operate as a *repeater*. In a revolver that would be the cylinder and its attendant pieces such as the bolt and hand or pawl and extractor. In a lever action, it would be the lever, cartridge carrier, breech bolt, ejector, extractor, magazine parts, etc. For a pump shotgun it would include the tubular magazine parts, cartridge carrier, action bar, pump handle, breech bolt, ejector and extractor, etc.

Firing mechanism
another one of the loose definitions of the word "action" which is usually intended to mean the functional components that make up the mechanism of a firearm that is used to fire it. For the intended purpose of this book the firing mechanism would consist of a hammer, trigger, perhaps a separate sear, a mainspring and trigger return spring, etc.

Firing pin: That part which actually strikes the cartridge primer, causing ignition. Firing pins may be hammer mounted as in the Colt SAA, free- floating/frame-mounted as with the S&W Safety Hammerless where it is struck by a falling internal hammer, or mounted within a breech bolt where it could be struck by a hammer as in the 1897 Winchester shotgun, or in bolt action rifles such as the 1898 Mauser the firing pin uses no separate hammer but is instead powered directly by a strong coil spring.

Firing pin bushing
a bushing which surrounds the firing pin. In the case of most revolvers this bushing is a hardened steel disc with a small hole at its center, that is pressed into the breech frame, forming a ring around the firing pin. The S&W Safety Hammerless revolvers used a frame-mounted, floating firing pin that was contained within a removable cup that was also called a *firing pin bushing*.

Firing pin protrusion
the measured distance a firing pin nose protrudes from the face of the standing breech or breech bolt on firing. Too little can cause misfires and poor ignition, too much may result in punctured primers. Nominal safe firing pin protrusion varies with different weapons but is as a rule between .052" and .060".

Forcing cone
in shotguns the forcing cone is that area inside the barrel and immediately in front of the chamber where the chamber's diameter is gradually reduced to bore diameter to ease the transition of the shot from the shell into the barrel, the forcing cone also performs the function of providing an enlarged area in the bore for the crimped portion of the shell to unfold into. With revolvers the forcing cone is the barrel's internal section referred to at the breech or rear end of the barrel which is tapered to a size slightly larger than bore diameter in order to assist the bullet in making a more gradual passage into the barrel's rifling from the cylinder chamber, and to help make up for small misalignments between the barrel and the cylinder's chamber.

Frame
another word for the receiver or breech frame.

Front-strap
on handguns, especially single action Colt type revolvers; the metal portion of the *grip frame (see)* forming the front of the grip and acting as the front support for the grips or stocks.

Gain twist
see *twist*.

Gas ring

originally used in S&W revolvers, a hardened steel bushing that was pressed into the front-center of the cylinder. The gas ring seal became an important feature which provided protection for the base pin against the intrusion of black powder gases, which if not contained could quickly foul the cylinder axis area and effect cylinder rotation. The front portion of the base pin bushing on the early cartridge Colt revolvers performed a similar function.

Grip

that portion of the frame of a revolver which forms the handle, or the removable parts that fit over the grip frame *(see)* to make up the handle.

Grip frame

on handguns, especially on revolvers; that portion of the metal frame which acts as the form and support for the hand grip.

Grip strap

on handguns, especially on revolvers; that portion of the metal frame which acts as the form and support for the hand grip, in this case the term "strap" would normally refer to specifically a front or rear grip strap.

Grooves

in a rifled barrel; the bottoms of the rifling. Those portions of the rifling that form the largest diameter circle.

Half-cock

an unfortunately indefinite term referring to the hammer's position that is most likely intended to refer to the act of raising the hammer to a safe or "at rest" position, a place where the firing pin cannot contact the primer and from where the weapon cannot be fired by a pull of the trigger. The exact intention of this term can vary; for some it might mean the safety position, for others it may refer to the loading position. For example, if the term were used in referring to a Winchester 1886 rifle or a Smith & Wesson Schofield revolver, *half-cock* would have to mean the *safety position*, because the Winchester 1886 and the S&W Schofield have only two "clicks" or positions above the fired position; those being safety and fully-cocked. *On the other hand*, should you be referring to the Colt Single Action Army, then the term *half-cock* could very well mean the "second click" or loading position since the SAA's hammer has three "clicks" above the fired position; safety, loading and fully cocked. We find it is safer to try and be more to the point by omitting the use of terms such as half or semi-cocked, instead referring to the hammer positions by more specific identifiers: the safety position, the loading position and the fully cocked position.

Hammer

the part of the firing mechanism that is cocked (placed under spring tension) by pulling it rearward with the thumb or by the action of a trigger's sear and which is made to fall forward by pulling the trigger, the falling hammer is under a heavy spring tension and so drives a firing pin or hammer nose into contact with the cartridge primer; firing the weapon. Depending on the type of operating mechanism the gun uses, hammers might also be cocked by the rearward movement of the breech bolt, like the ones used in the lever, or pump action designs, or by cocking levers *(see)* such as are found in many of the so-called "hammerless" shotgun designs.

Hammer cam

A small protrusion on the hammer which actuates the cylinder stop or bolt as the hammer rotates rearward, found on some single action revolvers that use hammer actuated cylinder stops (bolts), on Colt SAA revolvers the cam is removable, on Smith & Wesson single action revolvers the cam is not removable, being machined integral with the hammer.

Hammerless

most of the so-called "hammerless" weapons, and all of those which we will deal with in this book are not truly "hammerless" but actually do have hammers which are concealed internally. These include guns such as the Smith & Wesson *Safety Hammerless* revolvers and most "hammerless" double barrel shotguns. One good example of a true "hammerless" weapon would be the 1898 Mauser bolt action rifle or the Martini single shot rifle both of which use a striker *(see)*.

Hammer nose

S&W only, this is the same part that is called a firing pin on most firearms, see. The hammer nose on most S&W top-break (except the Safety Hammerless and Perfected Models) and on all S&W tip-up revolvers is not a separate, removable part but is forged and machined as one-piece with the hammer.

Hammer nose bushing

S&W only, this is the same part Colt calls the firing pin bushing *(see)*.

Hammer stud

on S&W style revolvers, the part which is screwed into the lock frame and that acts as the pivot for the hammer.

Hammer stud nut

a hollow, threaded nut with a screw slot on one side that threads onto the S&W hammer stud. It is used as the center sideplate screw on many S&W top-break revolvers.

Hand

that part of the revolver which is sometimes called the *pawl* and that actually causes the cylinder to rotate.

Headspace

a distance or clearance established and maintained between some reference point on the cartridge casing and the face of the standing breech or bolt in order to allow for both case and primer expansion, and insure action operation after firing. In revolvers specifically, this clearance is necessary to allow the cylinder to rotate after the cartridge has expanded from firing. This predetermined distance or clearance is termed headspace. For the rimmed cartridges we are generally concerned with here, headspace is determined as the distance between the rear of the cartridge rim and the front face of the standing breech or breech bolt. In revolvers, the measurement may also be gauged from the rear face of the cylinder to the front face of the standing breech or frame.

Keyhole

an oval or elongated hole in a paper target that is caused by a bullet striking the target in any other attitude than "head-on." The indications here are that the bullet is tumbling end-over-end, or at least it is tipping in flight, and

it likely has not been properly stabilized by the rifling in the barrel from whence it came, or the bullet has some serious imbalance or internal flaw, or that it may have hit something during its flight and become destabilized.

Lands

in a rifled barrel; the top of the rifling, that part of the rifling which engraves the bullet. Those portions of the rifling that form the smallest diameter circle.

Lever action

made world famous by the Henry and Winchester rifles and still very popular today, at one time lever actions were used in both rifles and shotguns. With most lever actions a looped under-lever is pulled (rotated) down, this causes the breech bolt to unlock and move to the rear, at the same timing cocking the firing mechanism. When the lever direction is reversed a new cartridge is fed and chambered as the breech bolt moves forward and is again locked into place; readying the weapon for firing. A few common examples of lever action rifles include the Winchester Models 1866 and 1873 and the Marlin Model 1894.

Lock

a too generalized term referring to virtually any sort of firing mechanism. The term *lock* originally referred to the entire firing mechanism of a muzzle-loading weapon, and still refers directly to the removable "locks" on better shotguns.

Lock frame

the receiver or frame; more specifically, the portion of the receiver which contains the action or lock components.

Mainspring

traditionally the most important spring in a firearm, the spring which normally provides the energy required to move the hammer or striker into contact with the cartridge primer, percussion cap or frizzen and to actually fire the weapon.

Martini action

an ingeniously simple single shot action invented in the U.S. by Peabody, later improved by the Swiss inventor Martini and used extensively by the British army. The Martini is hammerless, and uses a lever operated breech block which pivots down to expose the chamber.

Muzzle-loader

any firearm which must be loaded by inserting separate powder and projectile (or projectiles) directly into the barrel's muzzle, the rear or breech end of the barrel being closed except for a priming or touch hole. Percussion revolvers are by definition muzzle-loaders since the cylinder's chambers perform the function and fit the description of a muzzle-loading barrel.

Nipple

also sometimes called a percussion cone, the nipple is a removable, cone shaped part that is usually threaded into the rear of a muzzle-loading barrel or cylinder. The nipple's external area is a tapered cone shape to allow the percussion cap to be held for firing, its opposite internal end is in contact with the powder charge and provides a tiny hole to allows the flash from the fired percussion cap to enter the powder charge.

Obturation

The act of sealing the propellant gases within the bore and/or chamber of a gun by virtue of the expansion under gas pressure of the bullet, and when referring to metallic cartridges; the expansion of the cartridge case into the chamber walls as well.

Bullet Obturation

The process of bullet expansion that is caused by the action of high pressure gases and inertia acting on the base of the bullet, causing it to deform outward or expand, filling the rifling, thereby sealing the bore of the weapon. An exaggerated example of bullet obturation can be seen in the operation of the hollow-based, Civil War Minie-ball projectile.

Pump action

this kind of action is sometimes called a *slide* or *trombone* action and has been widely used, especially in the United States in both rifles and shotguns. A sliding forearm is pulled rearward and pushed forward again by the shooter in order to operate the breech mechanism. Common and popular examples of pump action weapons are the Winchester Model 1890 .22 rifle and the Winchester Model 1897 shotgun, both John M. Browning designs.

Ratchet

as applied to older firearms; one-directional gear teeth on the rear of the cylinder or on the rear of the extractor which are engaged and driven the by the hand (ratchet pawl) on their *active side* to cause the cylinder to rotate, and which provide a return or disengagement slope for the ratchet pawl (hand) on their *inactive side*.

Ratchet pawl

another name for the *hand (see)*.

Rebounding hammer

a hammer, or firing pin that is automatically retracted by some mechanical means into a slightly rearward position after having struck the cartridge primer, this is done to provide a safe means to carry the firearm with a live cartridge in the chamber with the hammer still in the lowered position. Modern shooters should understand that most 19th century rebounding hammer mechanisms cannot be considered absolutely safe, and that accidental discharges can occur with these types of systems. The Smith & Wesson .44 New Model Number 3 is an example of a 19th century revolver with a rebounding hammer.

Recoil shields

these are the side-flanges on revolvers that are formed as part of the standing breech frame directly behind the cylinder chambers. Simply put, the function of the recoil shield is to contain the cartridges in the cylinder chambers so they will not fall out to the rear.

RF

an abbreviation for rimfire.

Rolling block action

a very common type of single shot action that was made famous by and used mostly in Remington made firearms where the breech block rotates rearward and down to expose the chamber.

Sear

a pivoting piece in a firearm which is precision machined to engage a cock notch on the hammer or striker in order to hold the weapon cocked and ready to fire. In some instances the sear may be a separate part that is linked to the trigger, or it may be formed integrally with the trigger as it is in most single action revolvers and in some lever action rifles. Pulling the trigger to the rear causes the sear to pivot out of the hammer's or striker's full-cock notch, allowing the hammer or striker to fall under the heavy tension of the mainspring or striker spring to contact the cartridge primer and fire the weapon.

Side-lock action

a kind of action used mainly in shotguns, although not exclusively, where the action components are contained on side-mounted lock plates that are attached to the outside of, rather than being contained within the breech action.

Single action

any firearm which may only be fired by first manually cocking the hammer and then pulling a trigger to release it.

Sideplate

a removable access cover plate, usually provided on the side of a firearm action, that is removed in order to gain access to the weapon's internal parts. Sideplates are commonly found on most revolvers but may also be seen on some rifles, such as the toggle-action Winchesters.

Slip gun

a single action revolver that has had it's trigger mechanically tied to the rear or removed so that the gun may only be fired by fanning the hammer *(see)* or by slip-shooting which is the act of cocking the hammer and immediately allowing the hammer to fall by letting it slip away from the thumb as quickly as possible. Slip-shooting, or fanning can only be accomplished on single action revolvers which use hammer actuated cylinder stops *(see)*.

Solid head cartridge case

modern manufacture, extruded brass cartridge cases in which the rim area is formed up of solid brass, more completely encasing the primer pocket as opposed to the earlier and much weaker *balloon head cartridge casings (see)* which had hollow rims, internally unsupported primer pockets and a slightly larger powder capacity.

Stirrup

a small link which is mounted on the rear of a firearm's hammer and that acts as a hinged-link or connector between the mainspring and the hammer.

Stop notches

a.k.a. ***cylinder stop notches, bolt notches***. The machined locking notches around the outside of a revolver cylinder where the lug of cylinder stop or bolt fits in order to lock the cylinder's chamber into alignment with the barrel.

Stop notch leads

the short, tapered trough-like areas machined next to the cylinder stop notch (Colt calls these bolt notches) leading edges that allow the lug of the cylinder stop or bolt gradual entrance into the stop notch.

Stock

the part that enables the shooter to effectively hold a weapon and take aim. On rifles or shotguns this would be called the stock and would include both buttstock and forearm or fore-stock, on handguns the grips or handles collectively would be termed *stocks*.

Strain screw

a screw, usually mounted near the butt or grip area of a firearm that is used to adjust the tension of the mainspring or hammer spring.

Straw color

another old form of heat coloring *(see also blue, nitre)* and one of the so-called "temper colors". With this process the prepared steel parts were suspended in molten potassium nitrate (saltpeter) until a deep translucent straw (yellow-brown) color was achieved, the parts were then removed and instantly quenched in water, brine or oil.

Striker

essentially the firing pin. In many bolt actions the striker performs the operations of both a hammer and a firing pin.

Takedown

a sporting rifle or shotgun designed so that it's barrel may be readily removed for ease of transportation, these types of firearms usually make use of a form of interrupted barrel thread in order that the barrel may be removed by rotating it one-quarter of a turn.

Toggle action

a type of breech operating and locking system using a knuckle or knee-like hinged jointed breech-bolt mechanism that locks when it is straightened. The S&W Volcanic, Henry rifle, 1866, 1873 and 1876 Winchesters all used a kind of toggle action that was operated by a finger lever. The Luger semi-auto pistol and the Maxim machine gun are representative of other weapons which used the toggle-action principal.

Top-break action

a firearm whose barrel is hinged at the lower-front of the frame and locked closed by a latch at the top rear of the frame. Top-break actions have been applied to rifles, shotguns and revolvers. To open this type of weapon the latch or barrel catch is operated allowing the barrel to hinge down which exposes the chamber (chambers) for loading. Most top-break revolvers also use a feature introduced by Smith & Wesson in 1870; that of simultaneous, automatic cartridge extraction. S&W made many top-break revolvers as did Webley in England but in most people's minds, the most easily recognized sort of top-break action would be the classic double barreled shotgun.

Trap-door action

a type of single shot action using a breech block which pivots up and forward like the trap door in a barn. This was originally a conversion of the U.S. military percussion system and was made most famous by the Springfield Trap-door rifle, designed by E. S. Allin at Springfield Armory in Massachusetts following the U.S. Civil War.

Trigger

a metal bar, usually curved that protrudes from the bottom of a firearm and that when pulled, releases the sear engagement with the pre-tensioned hammer or striker allowing the hammer to fall; firing the weapon. In some double action designs, especially in revolvers, the trigger may be used to cock the hammer as well as to release it.

Trigger creep

creep is any noticeable, and usually unwanted movement in the trigger while it is being pulled between the time when its slack has been taken-up and the instant of the weapon's discharge.

Trigger guard

a band, normally made of metal that surrounds the bottom, front and rear of a trigger; protecting it from damage or from accidental discharge but still allowing the shooter full access to the trigger from the sides.

Trigger pull

the term refers to the amount of force expressed in pounds, which has to be applied to the face of the trigger in order to cause the trigger to move rearward far enough so that the gun will fire. Generally, the heavier the trigger pull is, the greater the likely-hood of the sights moving off the target before the bullet leaves the barrel, the lighter the pull is; the less becomes likely-hood that the sights will be disturbed by the action of pulling the trigger. Conversely, guns with a heavy trigger pulls are not known for going off accidentally, while on the other end of the spectrum, a gun with too light of a trigger pull can be dangerous and may greatly increase the occurrence of accidental discharges.

Trigger, spur or sheath

a trigger without a separate guard that, except for its front portion is more or less completely encased within the frame of the weapon. Such triggers are normally found on pocket-sized single action revolvers. Some good examples of spur triggers may be seen in the Smith & Wesson Tip-Up, rimfire revolvers.

Twist

twist is the rate that the rifling grooves turn or spiral on the inside of the gun barrel. The measured rate of this rifling twist is expressed as one turn in "so-many" inches, for instance if it is said that a certain barrel has a rifling twist rate of 1:18"; then this particular barrel has rifling grooves that twist at the rate of *one complete turn for each eighteen inches of barrel length*. Almost all barrels use what is known as "uniform twist rate", in other words the rate of twist is the same from the chamber to the muzzle. Long ago, many muzzle loading barrels and even a few military cartridge barrels were rifled using a process called "gain twist" where the rate of the rifling's twist actually increased as the bullet neared the muzzle. As an example of gain twist; the rifling may begin at the chamber end as one turn in fourteen inches and then gradually steepen, until at the muzzle the twist had reached a rate of one turn in eight inches.

WCF

the abbreviation for *Winchester Center Fire* cartridges.

Sources

Sources for historical research

Browning Firearms, Glen Jensen, Historian, One Browning Place, Morgan, Utah 84050, (800) 333-3288 ext 256. Factory letter fee: $25 per serial number.

Colt Firearms, Kathy Hoyt, Historian, P.O. Box 1868, Hartford, CT 06101, (800) 962-2658. Fee; $55+ per serial number ($100 for time-consuming research).

Dope Bag, NRA Publications, 11250 Waples Mill Road, Fairfax, VA 22030. Fee: free to NRA Members/Annual Membership $35 (Any firearm evaluated).

Remington Firearms, Leon Weir, 8268 Lone Feather Lane, Las Vegas, NV 89123, (702) 896-9283. Fee:free-$25 varies on extent of research.

Smith & Wesson Firearms, Roy Jinks, Historian, 2100 Roosevelt Ave., Springfield, MA 01102, (413) 781-8300. Fee: $25 per serial number.

Springfield Research Service, P.O. Box 4181, Silver Springs, MD 20904, (301) 622-4103. Fees vary from $10-$50 per serial #, Send SASE with request (U.S. Military issue rifles and handguns from post Civil War era).

Winchester Firearms (also Marlin & L.C. Smith), Cody Firearms Museum, Attn: Waddy Colvert, Buffalo Bill Historical Center, 720 Sheridan Avenue, Cody, WY 82414, (307) 587-4771. Fees: membership starts at $150. This allows each member 40 phone inquiries, complete with follow-up worksheet. For $30 more per serial # the member may receive a factory letter. Non-members may inquire for $45 per serial number.

Arms collector organization sources

Browning Collectors Association, Scherrle Brennac, 2749 Keith Dr., Villa Ridge, MO 63089 -1929. $30 initial & $10 additional. Dues $20 annually.

Colt Collectors Association, Karen Green; secretary, 25000 Highland Way, Los Gatos, CA 95030, (408) 353-2658. $35 annual, $500 Life

H&A Arms Society, 1309 Pamela Circle, Delphos, OH 45833.

Mannlicher Collectors Association, Don Henry, Exec. Secty/Treas., P.O. Box 7144, Salem, OR 97303. $20. annual, $300. Life

Marlin Fire Arms Collectors Assn, Dick Patterson, 407 Lincoln Bldg., Champaign, IL 61820. $10. per year, with $5. initiation fee

Merwin Hulbert Association, 2503 Kentwood Ct., High Point, NC 27265

Remington Society of America, 130 West South Boundary, Perrysburg, OH 43551, (419) 874-5385. $30 annual

Ruger Collectors Association, Inc., P.O. Box 240, Greens Farms, CT 06436. $25 annual

Smith & Wesson Collectors Association, Sheryle Cheely, 4912 Quail Creek Dr., Great Bend, KS 67530. $55 1st year USA, ($65. Foreign), $30. annual USA ($40. Foreign).

Winchester Arms Collectors Association, Pat Madis, Exec. Secretary, P.O. Box 230, Brownsboro, TX 75756, (903) 852-4027 or fax (903) 852-3029. $35 to join, $25 thereafter.

Sources for parts for obsolete firearms

Colt parts:

1877, 1878, Lightning rifle: Ed Cox, P.O. Box 21417, Keizer, OR 97307 (503) 390-1698. On the Internet at www.coltparts.com

SAA parts: Smith Enterprise, 1701 West 10th St., Ste.14, Tempe, AZ 85281 (480) 964-1818.
On the Internet at www.smithenterprise.com

SAA parts: Peacemaker Specialists, P.O. Box 157, Whitmore, CA 96096 (916) 472-3438.

SAA parts; Art Pirkle, 1344 W. 17th Place, Yuma, AZ 85364 (520) 783-9108 no catalog.

Smith & Wesson Obsolete Parts:

James Horvath, 117 South Alexandria, New Orleans 70119

Winchester Parts:

Buckingham's Winchester Parts, 501 Eaton Brazil Rd.,Trenton, TN 38382-9663.

Columbia Precision Parts, P.O. Box 301, Timnath, CO 80547 (303) 686-2865

Fred Goodwin, Sherman Mills, Maine 04776 (207) 365-4451 (Winchester lever gun parts)

Art Pirkle, 1344 W. 17th Place, Yuma, AZ 85364 (520) 783-9108

Western Rifled Arms, P.O. Box 236, Rochester, WA 98579 (360) 273-7716. (Screws & small parts for Winchester)

Miscellaneous gun parts:

Ballard, Remington, Stevens, Winchester Screws: Cedar Creek Screw and Machine, P.O. Box, 1531, Woodland, WA 98674.

Colt, Remington, many other obsolete firearms: Dixie Gunworks, P.O. Box 130, Union City, TN 38161 (901) 885-0700

Marlin, Rem, Stevens, Winchester parts & wood: Precision Gun Works, 110 Sierra Rd., Kerrville, TX 78028 (210) 367-4587.

Colt SAA, Ruger Blackhawk: Belt Mountain Ent., P.O. Box 3202, Bozeman, MT 59772 FAX (406) 388-1396

New (n) and/or obsolete (o) gun parts, all makes:

n/o: Brownells Inc., 200 S. Front St., Montezuma, IA 50171 (641) 623-4000 www.brownells.com

n/o: Jack First Inc., 1201 Turbine Dr., Rapid City, SD 57701 (605) 343-9544 www.1stingunparts.com
n/o: Numrich Gun Parts Corp, West Hurley, NY 12491 (914) 679-2417 www.e-gunparts.com
o: SARCO, 323 Union St., Stirling, NJ 07980 (908) 647-3800

Replica arms manufacturers and importers

Here is a look at some of the popular replica arms makers and importers who are doing business today selling guns of the new west:

Cape Outfitters. Cape Outfitters was started in 1970 by Don L. Shrum. Cape sells primarily Pedersoli-made replicas of Sharps cartridge rifles, rifle actions and guns in kit form. Also available are replica sights for Sharps and Winchesters, gun cases, and many other items which are featured in their catalog.

Cimarron Firearms Co., Fredericksburg, TX. CFA was founded in 1984 by Mike and Mary Lou Harvey in Houston, Texas. Cimarron markets an extensive line of replica firearms from the old west by Uberti, Pedersoli and Armi San Marco in Italy. Each Cimarron FA gun is fitted, finished and marked authentically to Cimarron's own specifications. Cimarron also pays the makers extra for better fit and finish than standard. Mike Harvey is very involved in Cowboy Action Shooting. CFA's new color catalog shows the full product line. Service and technical support are available.

Colt Blackpowder Arms. CBPA is licensed by Colt to produce replicas of their percussion handguns and rifles. Established in 1992 by Anthony Imperato. Anthony and his father Louis made the 2nd generation Colt black powder line from 1975-1982 in Middlesex, N.J. A full color catalog of CBPA firearms and accessories is available. Service, parts, and technical support is available for all 2nd and 3rd generation Colt Blackpowder Arms.

CVA; Originally begun in the early 1970s as Connecticut Valley Arms Co., by David Silk, CVA has been run by Bob Hickey since 1980. CVA sells rifles and handguns of both traditional and modern designs, as well as kit form guns and a large selection of accessories. From the beginning, CVA has had all their muzzle loading arms made by one company in Spain. A full color product line catalog is available, and includes some leather goods. Service, parts and tech support are available for all CVA products. New products include the ACCUBOLT™ and FIREBOLT™ muzzle loading rifles of modern design.

Dixie Gun Works, Inc., Gunpowder lane, Union City, TN. Founded in 1954 by Turner Kirkland, and still running strong for the new century. Dixie is run today by Turner's three sons, Lee Fry, Hunter and Charles Kirkland. Hunter is very interested in antique arms and you will find him attending most of the major antique gun shows. DGW's 700-plus page catalog is a wonder to behold, containing replica guns, gun parts, parts for original antique firearms, as well as an almost unimaginable plethora of frontier America and Civil War items. The Dixie catalog also holds an extensive line of black powder supplies, including leather goods. DGW provides full warranty service for the guns they sell; they also offer technical assistance to their customers. http://www.dixiegun.com

EMF Co.; EMF was begun by E. W. Spinney in 1956, and Boyd A. Davis has been the CEO since 1970. EMF sells a large line of replica percussion and cartridge handguns, also cartridge rifles of the old west. Cowboy shooters will be familiar with the EMF *Hartford Model* which has gained some notoriety in recent years. The EMF catalog shows their full product line, including accessories and leather goods. EMF provides service, parts and technical support for all the products they sell.

Euroarms of America, Inc. EOA was started about 25 years ago by Luciano Amadi. Euroarms sells a large line of flint and percussion rifles and handguns, as well as black powder accessories. Their weapons are primarily focused on the Civil War era and they do provide services and parts for the guns they sell. EOA can also give technical recommendations to their customers. A full product line catalog and parts catalogs are available. This company sells their products direct to dealers. Plans are being made for a home page on the Internet.

Navy Arms Corp., 689 Bergen Blvd., Ridgefield, NJ. (201) 945-2500. NAC is one of America's earliest established replica gun companies, founded in 1958 by Val Forgett. Navy Arms is a manufacturer and importer of an extensive array of replica firearms, covering weapons from the matchlock period through World War II. The most popular seller is the .44 Remington percussion with over 200,000 revolvers sold (as of 1997). Navy's chief honcho, Paul Reed, is also heavily involved in the shooting sports, including Cowboy Action Shooting where he has been making himself known as a championship grade shooter in his own right. NAC's free color catalog shows all their guns as well as swords, bayonets, leather goods, books, and obsolete ammo calibers such as .32 and .41 rimfires. *Recent new arrivals from Nav*y are a Smith & Wesson Russian, and an 1892 lever action replica in .44/40 and .45 Colt. Navy Arms offers service, parts and technical support. http://www.navyarms.com

C. Sharps Arms and Montana Armory, Inc. C. Sharps Arms was started by John Schoffstall in 1977. C.S.A. builds their own, hand-assembled, American-made (in Montana) high quality replicas of Sharps single shot rifles. Today the line includes Sharps in 1874 and 1875 models, a replica Winchester High Wall rifle, and classic sights. C.S.A. rifles come with an original purchaser lifetime warranty. Service, parts and tech support are available. The C. Sharps full line catalog is free with a $3.00 charge to cover shipping. A new monthly list of currently available rifles is available on request.

Stone Mountains Arms. A sister company of CVA (see) located in Norcross, GA, S.M.A. produces muzzle loading rifles of modern design in both traditional and contemporary styling, primarily for black powder hunting. The Stone Mountain Arms product line is covered in the CVA catalog.

Thompson/Center Arms. Most of us are familiar with the famous Thompson/Center Hawkin replica rifles, the brainchild of the company's founder Warren Center. T/C has been in business since 1967. Since 1970, they have been building muzzle loading firearms. Their full product line, shown in their color catalog, includes an impressive array of American-made Flintlock and percussion rifles, shotguns, and pistols, as well as black powder accessories. All Thompson Center firearms come with a lifetime warranty. http://www.tcarms.com.

Traditions Performance Muzzleloading. Traditions has been in business since 1984 selling traditional flint and percussion rifles and handguns, as well as contemporary design muzzle loading rifles. The full Traditions product line is displayed in a free, full color catalog. Service and technical support is available for all their products, including black powder accessories. A separate catalog of parts will be ready soon. Future plans call for new versions of current models, and some unidentified new models are now in the prototype stage. Drop in from your desktop at; e-mail traditions at: trad@ct2.nai.net

Uberti, U.S.A., Lakeville, CT. This company was founded in 1987 by Maria Uberti, the daughter of noted Italian arms maker Aldo Uberti, in order to market Uberti products under their own family name here in the United States. Uberti products will be familiar to most people who have purchased or used replica firearms within the last 39 years. Uberti USA sells direct to dealers and to some distributors. Their glossy, full color arms catalog shows their large and diverse product line of Uberti replica percussion and cartridge handguns and rifles. Full service, parts and factory technical support is available, as well as warranty services for Uberti USA's own products. A separate catalog of Uberti parts and accessories is also available. Visit Uberti USA on the Internet at: http://www.uberti.com

U. S. Fire Arms Mfg. Co. Located at Hartford, CT, USFAM was begun in 1993 by Doug Donnelly, and he began shipping guns in 1995. They manufacture replicas of the Colt 1873, Bisley, and Birdshead grip models. The frames come in as rough forgings from Aldo Uberti in Italy; we are told that all machine work and finishing is done in the USA at USFAM's factory. All their guns have a lifetime warranty to the original buyer. Interested parties may contact them via their web site: http://www.usfirearms.com

Firearms companies

Ballard Rifle & Cartridge Co., 113 W. Yellowstone Ave., Cody, WY 82414 (307) 587-4914
Browning Arms Co., One Browning Pl., Morgan, UT 84050 (801) 876-3331
Cape Outfitters, 599 County Road 206, Cape Girardeau, MO 63701 (573) 335-4103
Cimarron F.A. Company, 105 Winding Oak, Fredericksburg, TX 78624 (210) 997-9090
Colt's Manufacturing Co., P.O. Box 1868, Hartford, CT 06144-1868 (203) 244-1346
Dixie Gunworks, P.O. Box 130, Union City, TN 38281 (901) 885-0561
E.M.F. Company Inc., 1900 E. Warner Ave., Suite 1-D, Santa Ana, CA 92705 (714) 261-6611
European American Armory, P.O. Box 1299, Sharpes, FL 32959 (407) 639-4842
Euroarms of America, Inc., P.O. Box 3277, Winchester, VA 22604 (540) 662-1863
Marlin Firearms Co., 100 Kenna Drive, North Haven, CT 06473 (203) 239-5621
Navy Arms Co. Inc., 689 Bergen Blvd., Ridgefield, NJ 07657 (201) 945-2500
New England Firearms, 60 Industrial Row, Gardner, MA 01440 (508) 632-9393
Remington Arms Co. Inc., 870 Remington Drive, Madison, NC 27025-0700 (800) 243-9700
C. Sharps Arms Co., P.O. Box 885, Big Timber, MT 59011 (406) 932-4353
Shiloh Rifle Manufacturing, P.O. Box 279, Big Timber, MT 59011 (406) 932-4454
Sturm, Ruger & Co., 200 Ruger Rd., Prescott, AZ 86301 (520) 541-8820
Uberti USA, P.O. Box 469, Lakeville, CT 06039 (860) 435-8068
U. S. Fire Arms Mfg. Co., 55 Van Dyke Ave., Hartford, CT 06106 (877) 227-6901
U.S. Repeating Arms Co., 275 Winchester Ave., Morgan, UT 84050 (801) 876-3737

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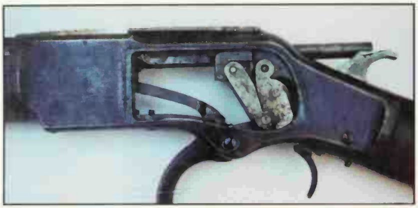
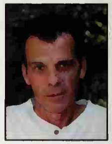
Fine-tune your firearms

A valuable tool for any collector, cowboy action shooter or lover of antique and replica guns!





Gunsmith David Chicoine, who has been restoring and repairing antique firearms for more than 20 years, shares his secrets for keeping classic firearms and the modern-day replicas in top shape. With chapters covering handguns, shotguns and rifles, this book offers a look at more than 40 models and outlines the differences between working on the originals and maintaining the replicas.

Detailed instructions are included for everything from making hard-to-find parts for antique guns to assessing a job and deciding if the work should be left to a skilled professional.

- **Exploded drawings**
- **Lists of parts**
- **Detailed instructions**
- **Differences between originals and replicas**

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